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MONTEREY, CALIFORNIA

MBA PROFESSIONAL REPORT

**Analysis of the United States Marine Corps Continuous Process
Improvement Program Applied to the Contracting Process at Marine
Corps Regional Contracting Office – Southwest**

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December 2007**

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**ANALYSIS OF THE UNITED STATES MARINE CORPS
CONTINUOUS PROCESS IMPROVEMENT PROGRAM
APPLIED TO THE CONTRACTING PROCESS AT MARINE CORPS
REGIONAL CONTRACTING OFFICE – SOUTHWEST**

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ABSTRACT

This MBA Project outlines the components of CPI while providing an example and an assessment of its application in the Regional Contracting Office-Southwest (RCO-SW). Budgetary constraints require the Marine Corps to function as efficiently as possible. Continuous Process Improvement (CPI) provides the enterprise-wide approach by which the Marine Corps will generate necessary efficiencies. The primary focus of CPI in the Marine Corps is improving support to the warfighter.

The purpose of this project is to examine the United States Marine Corps Continuous Process Improvement Program as it applied to the Marine Corps RCO-SW to determine possible reductions in procurement administrative lead time (PALT). Lean, Six Sigma, and the Theory of Constraints (TOC) are predominant process improvement methods used in business and the Department of Defense to make better products and provide faster service, resulting in increased end-user satisfaction. The RCO-SW has been identified as a pilot program for the implementation of the Marine Corps CPI Program. The objectives of this project are to study the process improvement methods and examine how they can be applied during the execution of a process improvement project.

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LIST OF ACRONYMS AND ABBREVIATIONS

ACMC	Assistant Commandant of the Marine Corps
ADC, I & L	Assistant Deputy Commandant, Installations & Logistics
ADCON	Administrative Control
AFCEP	Air Force Contracting E-Business Procedures
AO	Area of Operation
APC	Agency Program Coordinator
ASN, RD & A	Assistant Secretary of the Navy, Research, Development & Acquisition
AVN	Aviation
BCM	Business Clearance Memorandum
BEA	Business Enterprise Architecture
BTESG	Business Transformation Executive Steering Group
C2	Command and Control
C4	Command, Control, Communications and Computers
C4/CIO	Command, Control, Communications and Computers/Chief Information Office
CBE	Center for Business Excellence
CBT	Computer Based Training
CCF	Contingency Contracting Force
CCO	Contingency Contracting Officer
CD	Contracts Division
CD & I	Capability Development & Integration
CED	Cause and Effect Diagram
CG, MARFORLOGCOM	Commanding General, Marine Forces Logistics Command
CG, MCCDC	Commanding General, Marine Corps Combat Development Command
CKO	Contingency Contracting Officer
CMC	Commandant of the Marine Corps
CMPG	Contract Management Process Guide
CPARS	Contractor Performance and Assessment Reporting System
CPI	Continuous Process Improvement
CPITG	Continuous Process Improvement Transformation Guidebook
COMMARCORSSYSCOM	Commander Marine Corps Systems Command
CWT	Customer Wait Time
DAWIA	Defense Acquisition Workforce Improvement Act
DC, AVN	Deputy Commandant, Aviation
DC, CD	Deputy Commandant, Combat Development
DC, I & L	Deputy Commandant, Installations & Logistics
DC, M & RA	Deputy Commandant, Manpower & Reserve Affairs
DCMA	Defense Contract Management Agency
DC, P & R	Deputy Commandant, Programs & Resources

DC, PP & O	Deputy Commandant, Plans, Policies and Operations
DFAS	Defense Finance Accounting Service
DIR, C4	Director, Command, Control, Communications and Computers
DMAIC	Define, Measure, Analyze, Improve, Control
DoD	Department of Defense
DoN	Department of the Navy
EDA	Electronic Document Access
FAR	Federal Acquisitions Regulations
FEDBIZOPP	Federal Business Opportunities
5 M & E	Manpower, Material, Method, Machine, Measurement & Environment
5 S	Sort, Straighten, Shine, Standardize, Sustain
FMEA	Failure Modes and Effects Analysis
FPDS-NG	Federal Procurement Data System-Next Generation
FTE	Full Time Equivalent
GCPC	Government Wide Commercial Purchase Card
GPE	Government Point of Entry
GS	General Schedule Employee
GSA	General Services Administration
HCA	Head of Contracting Activity
HICVS	High Impact Core Value Stream
HPO	High Performance Organization
HQMC	Headquarters Marine Corps
I & L	Installations and Logistics
IPM	Integrated Performance Management
LB	Logistics Branch
LOGCOM	Logistics Command
LSS	Lean Six Sigma
MAGTF	Marine Air Ground Task Force
MAPS	Marine Corps Acquisition Procedures Supplement
M & RA	Manpower and Reserve Affairs
MARDIV	Marine Division
MARFORS	Marine Forces Commands
MARFORCOM	Marine Forces Commands
MARFORPAC	Marine Forces Pacific
MAW	Marine Air Wing
MBA	Master of Business Administration
MCAS	Marine Corps Air Station
MCBE	Marine Corps Business Enterprise
MCBEO	Marine Corps Business Enterprise Office
MCCDC	Marine Corps Combat Development Command
MCFCS	Marine Corps Field Contracting System
MCI	Marine Corps Installations
MCIW	Marine Corps Installations West

MCLC	Marine Corps Logistics Command
MCPIA	Marine Corps Productivity Investment Account
MCRC	Marine Corps Recruiting Command
MCRD	Marine Corps Recruiting Depot
MCSC	Marine Corps Systems Command
MEF	Marine Expeditionary Force
MLG	Marine Logistics Group
MOS	Military Occupational Specialty
MROC	Marine Requirements Oversight Council
MROC-DM	Marine Requirements Oversight Council-Decision Memorandums
NAFI	Navy Air Force Interface
NAVAIR	Naval Air Systems Command
NAVSEA	Naval Sea Systems Command
NCR	National Capital Region
NECO	Navy Electronic Commerce On-Line
NVA	Non-Value-Added
OCONUS	Outside Continental United States
OMB	Office of Management and Budget
OPCON	Operational Control
OPFORS	Operating Forces
PALT	Procurement Administrative Lead Time
P & R	Programs & Resources
PD2	Procurement Desktop-Defense
POC	Point of Contact
PP & O	Plans, Policies & Operations
PPMAP	Procurement Performance Management Assessment Program
PR	Purchase Request
PRB	Purchase Request Builder
QA	Quality Assurance
RCO	Regional Contracting Office
RCO-E	Regional Contracting Office-East
RCO-SW	Regional Contracting Office-Southwest
RCO-Q	Regional Contracting Office-Quantico
RPN	Risk Priority Number
SADBU	Small and Disadvantaged Business
SAP	Simplified Acquisition Procedures
SE	Supporting Establishment
SIPOC	Suppliers, Inputs, Processes, Outputs, Customers
SMED	Single Minute Exchange of Dies
SOP	Standard Operating Procedures
SOW	Statement of Work
SPAWAR	Space and Naval Warfare Systems Center
SPC	Standard Procurement System

SUR	Set Up Reduction
TECOM	Training and Education Command
TOC	Theory of Constraints
USC	U.S. Code
USMC	United States Marine Corps
VOB	Voice of Business
VOC	Voice of Customer
WAWF	Wide Area Work Flow

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EXECUTIVE SUMMARY

Overview

The primary focus of Continuous Process Improvement (CPI) within the Marine Corps is improving support to the warfighter. Lean, Six Sigma, and the Theory of Constraints (TOC) are predominant process improvement methods incorporated into the Marine Corps CPI Program.

Purpose

The report focuses on two objectives. First, it provides an analysis of the Marine Corps CPI Program as it applied to the Marine Corps Regional Contracting Office-Southwest to determine possible improvements to reduce procurement administrative lead time (PALT). Second, it provides a one source document for the Fleet Marine to become familiar with the concepts of CPI, Lean Six Sigma, and Theory of Constraints applicable to the unique Marine Corps culture and environment.

Findings

First, CPI projects focus on supporting the warfighter and are aligned with top-level CPI guidance and the organizational mission. Second, CPI projects can identify areas of improvement that result in decreased PALT and increase the satisfaction of the warfighter. Third, for improvements to be effective, implementation must include leadership commitment, a robust training plan, and a system of rewards and reinforcement.

Recommendations

- Focus on the customer (warfighter).
- Mistake-proof Purchase Request (PR) Builder and develop customer relations.
- Apply control measures to reinforce improvements.
- Incorporate rewards and reinforcement into the CPI Program.
- Encourage CPI training and make CPI practitioner billets attractive.
- Empower the Marine Corps Business Enterprise Office to a status equivalent to all deputy commandant offices.

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I. INTRODUCTION

A. BACKGROUND

We shall not cease from exploration and the end of all our exploring will be to arrive where we started and know the place for the first time.

— T.S. Eliot

Lean, Six Sigma, and the Theory of Constraints (TOC) are predominant process improvement methods used in business and the Department of Defense to make improved products, provide faster service, and increase end-user satisfaction. The Marine Corps Continuous Process Improvement (CPI) Program incorporates elements of these process improvement methods. The Marine Corps Business Enterprise Strategic Plan was developed to improve performance and reduce cost through continuous process improvement and specific end-to-end process analysis and review. The Regional Contracting Office-Southwest (RCO-SW) has been identified as a pilot program for the implementation of the Marine Corps CPI Program to the contracting process.

In May 2006, the Deputy Secretary of Defense released a Memorandum establishing Department of Defense Continuous Process Improvement Programs and introducing the DoD Continuous Process Improvement Transformation Guidebook (DoD CPITG). “DoD CPI is a strategic approach for developing a culture of continuous improvement in the areas of reliability, process cycle times, cost in terms of less total resource consumption, quality, and productivity” (Deputy Secretary of Defense, 2006, p.4). CPI comprises the application of a broad range of tools and methods, such as Lean, Six Sigma, and Theory of Constraints (TOC). The Deputy Secretary of Defense discusses the benefits of CPI in the memorandum. In it, he states,

CPI has proven to be an important tool for improving the operating effectiveness of the DoD, not only within logistics and acquisition activities, but also across the full range of operational, administrative, science and technology, and support functions.

(Deputy Secretary of Defense, 2006, DoD CPI Memorandum ¶ 2)

In December 2006, a working draft of the United States Marine Corps Continuous Process Improvement Program Guidebook was issued to key personnel responsible for CPI implementation for the Marine Corps. It states the Commandant of the Marine Corps (CMC) and Assistant Commandant of the Marine Corps (ACMC) have the responsibility for initiating, empowering, and supporting the CPI Program at the executive level.

As the Champions of the program, they set high-level objectives, help maintain the momentum of program development, and obtain support and endorsement at the executive level. Most importantly, they are responsible for how CPI will be applied to the Marine Corps.

(Marine Corps Business Enterprise Office, 2006, p. 9)

The Regional Contracting Office-Southwest (RCO-SW) is a component of the Marine Corps Business Enterprise (MCBE). The USMC Business Plan outlines the Commandant's direction to manage the Business Enterprise of the Marine Corps through better business practices. The USMC Business Plan attempts to adopt the best business practices of both the private sector and other government agencies to improve the levels of support provided to the operating forces. "This plan speaks to management of installation activities-including core competencies and non-core competencies, inherently governmental and commercial activities-and installation functions" (ACMC, 2003, p. iii).

The Business Plan further delineates the responsibility for coordination of its implementation to the USMC Center for Business Excellence (CBE). The CBE will further identify and apply the best business practices across the Marine Corps in conjunction with key business enterprise stakeholders and functional program managers.

(ACMC, 2003, p. iii)

The Business Enterprise is composed of those components of the Marine Corps' active and reserve forces that provide the goods and services needed to ensure the successful performance of the mission of the operating forces. The Business Enterprise has three components: Acquisition, Logistics and Combat Service Support, and Installations.

(ACMC, 2003, p. iii)

The focus of our analysis will be on the Marine Corps Installations component of the Business Enterprise; specifically the contracting process of RCO-SW that supports those installations.

B. OBJECTIVES OF RESEARCH

Can CPI realistically affect the reduction of the Procurement Administration Lead Time (PALT) in the RCO-SW? The RCO-SW CPI project functions as litmus of performance for the Marine Corps' overall CPI Program. End state: Determining CPI's effectiveness in reducing PALT at the RCO-SW.

The parallel goal of this project is to create a document that provides realistic direction and guidance to the end user: the Fleet Marine. Consider this report a user-friendly reference to the chain of events, actions and results of a single Pilot Program.

The Marine Corps is not a financial institution. It does not exist to save taxpayers money or create enhanced business models to be mirrored by corporate America. The bottom line does not include money saved or freedom at a reduced cost to the taxpayer. The sole purpose of its existence is to be a force in readiness; always ready to fight the next fight and defend America's freedom via any method necessary. The Marine Corps CPI program translates the Department of Defense and Department of the

Navy's CPI guidance into a language that is compatible with our very distinct culture and environment. America has maintained a Marine Corps throughout its history because America strongly desires a Marine Corps to fight battles and win wars. CPI means something different to the Marine Corps and consequently its implementation cannot be judged on a strict business model. "While affordability/cost benefit is indeed an issue that no American Force can ignore, the primary focus of the Marine Corps CPI program is improving support to the warfighter, not cost reduction" (Marine Corps Business Enterprise Office, 2006, p. 16).

Objectives of this MBA Project:

- Describe Marine Corps CPI Program and its elements of Lean, Six Sigma and Theory of Constraints
- Describe the organizational structure of the regional contracting office (RCO)
- Identify the current contracting processes at the RCO
- Map the process flow and value streams at the RCO
- Identify bottlenecks, non-value added activities and delays at the RCO
- Make recommendations that result in reduced PALT at the RCO
- Offer recommendations for future projects with respect to project selection and implementation.

C. RESEARCH QUESTIONS

Through discussions with the CPI team at RCO-SW, the following questions were developed as a basis for this research:

1. Primary Research Question

Can CPI identify feasible improvements to be made in the Marine Corps contracting process to reduce procurement administrative lead time?

2. First Subsidiary Question

What principles of Lean, Six Sigma, and Theory of Constraints apply to the CPI project at the contracting office?

3. Second Subsidiary Question

How can CPI be effectively implemented within Marine Corps culture?

4. Third Subsidiary Question

Once improvements are implemented, will RCO-SW witness a substantial reduction in lead time?

5. Fourth Subsidiary Question

What recommendations can be made to make future implementation of CPI projects more successful?

D. BENEFITS OF STUDY

Continuous process improvement incorporates the tools and concepts of Lean, Six Sigma, and the Theory of Constraints. Each methodology can be applied separately or elements from each can be applied together, such as in a Lean Six Sigma improvement project. This MBA project report provides a one-source document that shows how the overarching DoD and USMC CPI guidance translates into an actual improvement project.

E. SCOPE AND LIMITATIONS

1. Scope

The MBA project focuses solely on the USMC CPI project conducted at the RCO-SW.

2. Limitations

The members of this MBA project were not official members of the RCO-SW CPI team. The authors did not receive team training, nor participate in the process improvement activities. Due to time and proximity constraints, observation of the improvement project was limited to a monthly contact with the CPI team.

F. METHODOLOGY

This project relied on primary and secondary research methods to examine process improvement methodology and the conduct of a CPI project.

One MBA team member traveled to the RCO-SW once a month for the duration of the project. He was able to observe and interact with the RCO-SW team members, learn from their techniques, and review and discuss their findings. Another member enrolled in distance education courses and received Six Sigma Green Belt and Lean Six Sigma certificates from Villanova University. The third member enrolled in a course to receive his Green Belt certificate from the Naval Postgraduate School.

Secondary research included reviews of DoD and USMC CPI program guides and plans, published books, scholarly journals, trade magazines, and academic research papers focused on CPI. The research provided historical perspective and an overview of continuous process improvement methodologies.

G. ORGANIZATION OF THE PROJECT

This project is divided into five chapters. Chapter I provides a short background, identifies research questions, describes benefits of study, and addresses scope and limitations. Chapter II addresses the foundation of continuous process improvement by presenting DoD and USMC guidance and process improvement methodologies. Chapter III outlines the organization and activities at RCO-SW. Chapter IV examines and assesses the CPI project at RCO-SW. Chapter V provides conclusions and recommendations.

II. CONTINUOUS PROCESS IMPROVEMENT FOUNDATION

A. INTRODUCTION:

On 3 November, 2004, the Commandant of the Marine Corps stated:

The Marine Corps is a combat force, not a business. To be successful however, we need to support warfighting excellence with well-managed business processes that are both effective and efficient. The transformational changes required in our business processes will not be quick, easy, or without informed risk. But we must stay the course to ensure a stronger and more ready Marine Corps of 2015 that is firmly founded on the principles of strict economy and focus of effort.

(Marine Corps Business Enterprise Office, 2006, p. 3)

This chapter establishes a necessary foundation essential to comprehending USMC CPI. Top-level CPI Program guidance translates down to the tactical level of process improvement projects. The concepts and techniques of Lean, Six Sigma and Theory of Constraints will be addressed. These popular improvement methodologies constitute the framework of the DoD and USMC CPI programs. This foundation, from executive-level to tactical level, will prepare the reader for the examination and analysis of the actual process improvement project covered in subsequent chapters.

B. USMC BUSINESS ENTERPRISE STRATEGIC PLAN

1. Introduction

Marine Corps Business Enterprise Strategic Plan provides the strategic vision, supporting concepts and the way ahead for The United States Marine Corps. The Marine Corps Business Enterprise (MCBE) covers a broad spectrum of organizational lines and includes all resources, processes, products and services that support the modern warfighter. Specific goals and strategies are based on Marine Requirements Oversight Council Decision Memorandums (MROC DM) and the Marine Corps' Programming

Guidance. This plan provides commanders the direction for an orderly and comprehensive approach to change business practices through continuous, end to end process improvement. (CMC, 2004)

2. Mission, Vision, Values

Mission: “Improve Marine Corps warfighting excellence through continuous commitment to perform business processes better and at lower cost” (CMC, 2004, p. 3).

Vision: “Dramatically improved delivery of the right products and services to the right place, at the right time, and at the most efficient total cost for the warfighter” (CMC, 2004, p. 3).

Values: “Strict economy and focus of effort” (CMC, 2004, p. 3)

3. Guiding Principles

The principles listed below are the most important principles by which the MCBE operates (CMC, 2004).

- First: To be fair, effective and efficient.
- Second: Business process products and services exist to satisfy needs of the operating forces. All products and services will be delivered in a timely and regular manner to OCONUS forces as well as local forces.
- Third: The total force is the most important asset. The Corps excels at recruiting, training and leading Marines. That excellence will be transferred to the development of the other two elements of the force: civilian-Marines and contractors.
- Fourth: The Marine Corps core, critical enabling and non-core competencies guide appropriate human resources across the board.

a. Core Competencies:

- Linked to operating forces readiness
- The focus of military leaders
- Performed by Marines
- World class performance standards (CMC, 2004)

b. Critical Enabling Competencies:

- Activities that directly affect operating force readiness
- Focus of civilian-Marine leaders
- Performed by mostly civilian-Marine through some contractor support
- Normally organized and provided on a regional basis
- Less-than world class performance standards (CMC, 2004)

c. Non-Core Competencies:

- Common services needed by operating forces, individual Marines or family members
- Managed by civilian Marines
- Mostly commercial in nature
- Performed by the most effective and efficient provider that meets best value for the warfighter
- Rarely performed by Marines
- Normally organized on a regional basis for economy of scale (CMC, 2004)

4. Goals

Transformation of our military forces hinges on being able to reduce redundancy, focus organizations on executive goals, flatten hierarchies, and cut cycle times in the decision process.

(Secretary of Defense 2002 Annual Report as cited in CMC, 2004, p. 6)

a. Goal 1: Optimize Resources by Increasing Effectiveness and Efficiency

Optimize resources by aggressively pursuing continuous process improvement across the business enterprise. Commanders ensure readiness is instilled within individual limits in order to free resources to support current and 2015 MAGTF capabilities. Informed risk is acceptable and resources are balanced and managed to meet near and long term mission requirements. Strategies to achieve goal 1: Improve performance and reduce cost through continuous process improvements and the approach

of analysis as an end to end process, rather than as the sum of separate functions. Continue to implement competitive sourcing strategy. (CMC, 2004)

b. Goal 2: Maintain Effective Governance of Business Transformation

End to end process improvement involves all Marine Corps business processes and organization levels. It requires a strong approach that involves coordination, communication and monitoring. Strategies to achieve goal 2: Establish strong governance through MROC, engaging commanders, MAGTF proponents and program sponsors in business that optimize resources and improve warfighting capacity. Implement aggressive internal and external communication plans addressing DoD, DON, and USMC. Remove constraints of innovation and creativity. Enhance interaction with DoD and DON. (CMC, 2004)

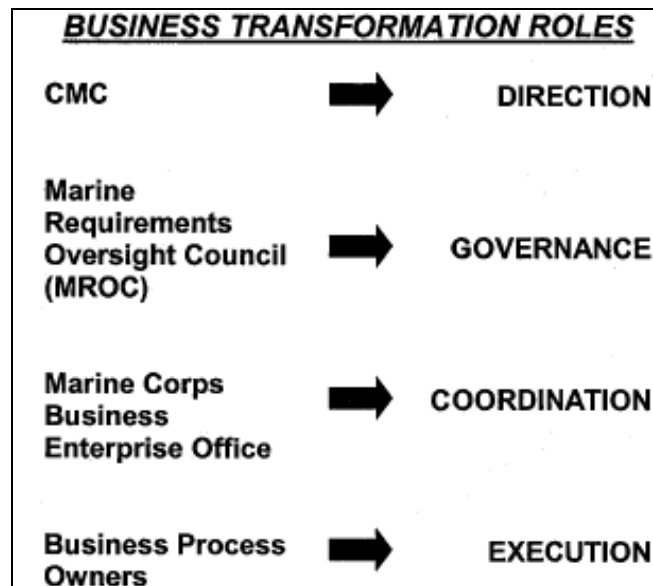


Figure 1. Value Creation (From CMC, 2004)

c. Goal 3: Enable the Workforce to Achieve Business Objectives

The business enterprise must be organized, equipped and trained to support operational, training and quality of life requirements. The workforce must possess adequate tools to effectively manage performance and cost. Strategies to achieve goal 3: Identify knowledge, skills and abilities required by the workforce tasked to manage the business enterprise. Link individual performance plans, appraisals and contract deliverables to strategic and campaign plans. Optimize business tools through standardization to the maximum extent possible. (CMC, 2004)

5. Strategic Scorecard

Today, organizations are competing in complex environments so that an accurate understanding of their goals and methods for attaining those goals is vital. A scorecard provides the framework for a strategic measurement and management system.

(Kaplan and Norton's work as cited in CMC, 2004, p. 10)

A scorecard is the mechanism linking the strategic plan to the organizational goals established by the CMC and the MROC. The definition of a scorecard is a "table or record enabling a spectator to identify players and record the progress of a game or competition" (Pickett et al., 2000, p. 1100). The MCBE scorecard provides a single page view of the strategic plan including Measures and Targets. There are five key requirements to execute strategy:

- Translate the strategy into operational terms.
- Align organizational resources to the strategy
- Make strategy everyone's everyday job
- Make strategy a continual process
- Mobilize change through strong effective leadership (CMC, 2004)

The scorecard is used to communicate the overall strategy to every individual in the organization. Goals are linked to the organizational scorecards and successful

implementation of strategy becomes everyone's job. Organizational scorecards are a powerful tool to mobilize change and transform all aspects of an organization.

The scorecard measures monitor the progress of the goals and strategies within the plan, then are forwarded to the ACMC and the MROC.

6. Action Guidance

Economy of Force: Employ all combat power available in the most effective way possible; allocate minimum essential combat power to secondary efforts. With many more available targets than assets, each unit must focus its attention on the primary objectives.

(NAVAL WARFARE, NDP 1 as cited in CMC, 2004, p. 12)

Advocates and commanders aggressively engage in the campaign to transform the business processes throughout the Marine Corps. Figure 2 lists all of the processes and their respective owners.

<u>Process</u>	<u>Process Owners</u>
Installation Support:	DC, I&L
Combat Service Support/Logistics:	DC, I&L w/CG MARCORLOGCOM
Acquisition:	COMMARCORSYSCOM
Information Technology:	Dir, C4
Training:	CG, MCCDC (TECOM)
Financial Management:	DC, P&R
Human Resource Management:	DC, M&RA
(includes Marine Corps Community Services)	

Figure 2. Process and Process Owners (From CMC, 2004)

7. The Process Owners Defined

a. The Deputy Commandant for Installations and Logistics

This individual leads and coordinates the campaign. He/she publishes a Strategic Business Plan to guide the effort and reports progress through the MROC to CMC (CMC, 2004).

b. The Deputy Commandant for Plans, Policies and Operations

The position ensures the readiness and capability of current forces is adequate to meet obligations and war plan requirements (CMC, 2004).

c. The Deputy Commandant of Combat Development

The position ensures the Marine Corps has a clear understanding of its capabilities and requirements (CMC, 2004).

d. The Deputy Commandant of Manpower and Reserve Affairs

The position leads the military-civilian planning groups which redirect Marines from non-military billets into operating force billets (CMC, 2004).

e. The Deputy Commandant for Programs and Resources

The position publishes fiscal guidance that ensures savings are reinvested in the Marine Corps (CMC, 2004).

C. DOD CONTINUOUS PROCESS IMPROVEMENT GUIDEBOOK

On 11 May 2006, the Secretary of Defense released the DoD Continuous Process Improvement Transformation Guidebook (DoD CPITG) as a resource for use in designing and managing CPI efforts (Deputy Secretary of Defense, 2006). This section provides a synopsis of the DoD CPITG as part of an informed CPI foundation.

1. Introducing DoD CPI

“There is great promise for DoD to leverage, expand, and connect past isolated CPI successes as it establishes an overriding CPI culture that converges on best practices, and shares information among its organizations” (Deputy Secretary of Defense, 2006, p. 1-1).

2. DoD CPI Framework

DoD CPI has evolved from three improvement methodologies:

- Lean: focused on eliminating non-value-added waste in a process or service
- Six Sigma: focused on reducing variation in a process
- Theory of Constraints: focused on optimizing throughput. (Deputy Secretary of Defense, 2006)

The CPI objectives align an organization’s processes to shorten cycle time without diminishing reliability or increasing cost. Simply stated, cycle time refers to the time required to complete each step in a process. Reliability refers to the degree of certainty that goods and services will perform as intended over a set period of time

a. Area 1 - Fundamental Concepts of CPI

Four fundamental concepts for effective CPI implementation are: CPI “musts,” CPI principles, value stream focus, and CPI culture.

(1) CPI “Musts.” Public and private sector experience indicates that the following “musts” are required for successful CPI implementation:

- Champions, Steering Committees, Support Teams, and Work Groups
- Goals that are strategically aligned, mission related and add customer value
- CPI plan that utilizes the methodology of problem Definition, Measurement, Analysis, Improvement and Control (DMAIC)
- Strong and visible leadership commitment that supports CPI. (Deputy Secretary of Defense, 2006)

(2) CPI Principles. Seven principles have evolved from organizations engaged in CPI implementation:

- Determine the current situation using objective (fact-based) data analysis
 - Analyze problems as a variation from a known or expected standard
 - Set a goal to improve the system
 - Focus on the people, machines, and systems that add value
 - Improve processes through continuous controlled experimentation
 - Make decisions based on long-term improvement
 - Encourage partnering with suppliers, customers, and other stakeholders.
- (Deputy Secretary of Defense, 2006, p. 2-3)

(3) Value Stream Focus Within the Enterprise. Successfully applying CPI within an enterprise requires a comprehensive value stream. Value stream mapping is centered on the customer. Figure 3 is an example of a notional value stream for a DoD weapon system.

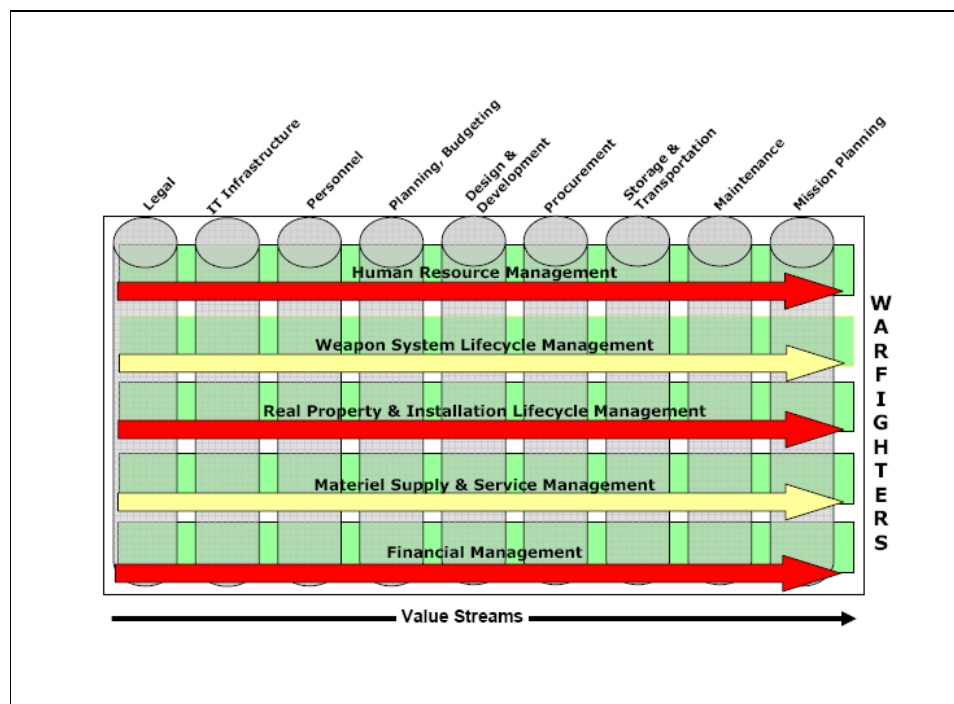


Figure 3. Value Streams and the DoD Enterprise (From Deputy Secretary of Defense, 2006)

(4) Effective CPI culture is comprised of several core values:

- Mutual trust and respect within the extended enterprise
- Voice of the customer comes first
- Dissatisfaction with the status quo
- Awareness of the cost of actions that impact the customer
- Receptiveness to new CPI tools and concepts. (Deputy Secretary of Defense, 2006)

b. Area 2 - The CPI Deployment Cycle

CPI concepts are practiced through the disciplined CPI deployment approach shown in Figure 4.

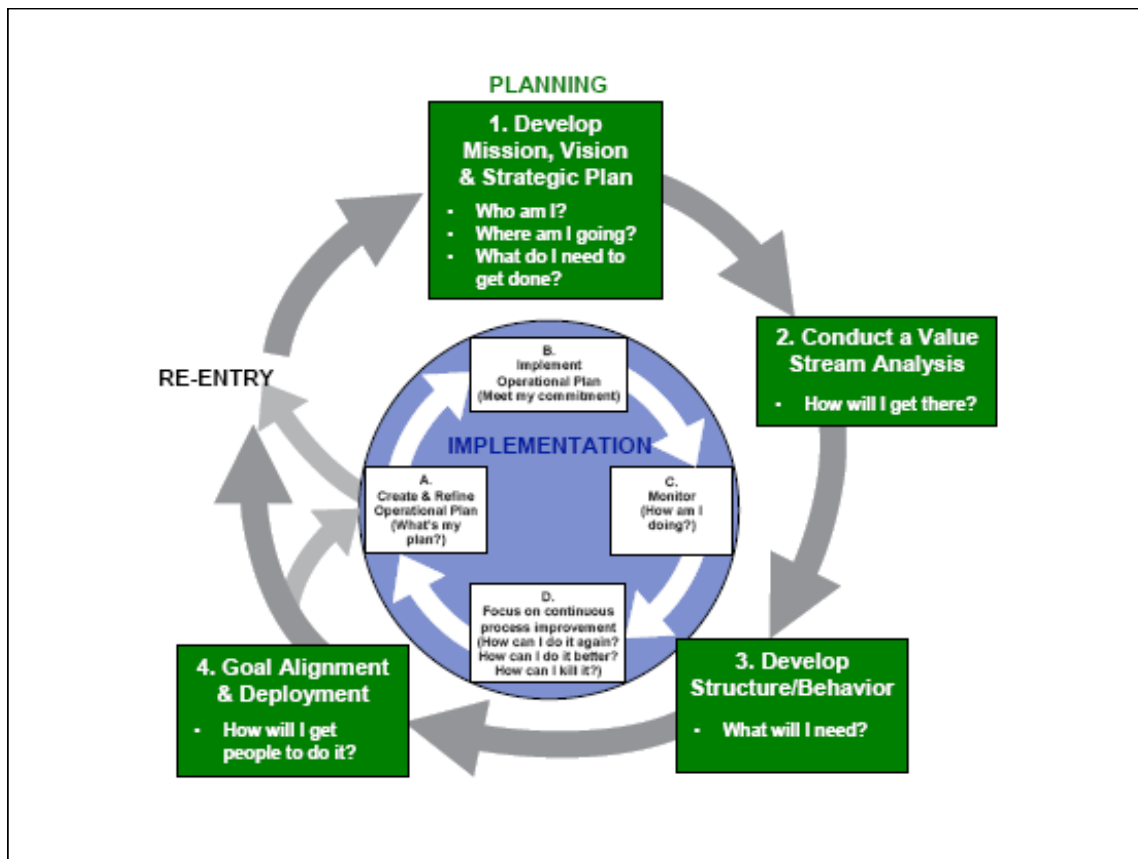


Figure 4. CPI Deployment Cycle (From Deputy Secretary of Defense, 2006)

The steps in the above CPI deployment cycle:

- Step 1: Develop Mission, Vision, and Strategic Plan
- Step 2: Conduct value stream analysis
- Step 3: Develop structure and behavior
- Step 4: Align and deploy goals
- Step 4A: Create and refine Operational Plan
- Step 4B: Implement Operational Plan
- Step 4C: Monitor
- Step 4D: Focus on CPI
- Step 5: Re-enter and return to the beginning to revisit all the steps. (Deputy Secretary of Defense, 2006)

c. Area 3 - Operational Plan

The Operational Plan must support the Strategic Plan. The goals for the plan are:

- Provide the actions to achieve the specific organizational transformation
- Recognize and build on current good practices. (Deputy Secretary of Defense, 2006, p. 2-10)

d. Area 4 - Change Management

Managing change is integral to successful CPI implementation. Keys to systematic change management are to:

- Educate leaders
- Challenge presumptions
- Secure agreement
- Prepare leaders to lead
- Prepare staff to manage change
- Educate the organization members
- Use DMAIC to identify and carry through with CPI initiatives. (Deputy Secretary of Defense, 2006)

e. Area 5 - Metrics

Metrics are the means to determine whether goals have been achieved. Metrics need to be aligned with the organization's goals. The outcomes to measure are those that have value to the customer. CPI metrics have five characteristics:

- Valid: measure what is intended
- Obtainable: gathered in a timely manner
- Accurate: give the right information
- Repeatable: give the same answer every time
- Actionable: allow us to do something with the information provided. (Deputy Secretary of Defense, 2006)

3. CPI Roles and Responsibilities

CPI responsibilities are spread throughout the organization. Primary roles and responsibilities include:

- **CPI Champion:** The Champion leads CPI within the organization through sponsorship and drives the development of the mission, vision, and strategic plan. The Champion ensures that resources are available to the CPI Steering Committee, CPI Support Teams, and CPI Work Groups.
- **CPI Steering Committee:** The Steering Committee develops strategies, operational plans and metrics, monitors performance and provides guidance.
- **CPI Support Team:** Support Teams provide education, training and facilitation of DMAIC project management. The Support Team works closely with the Steering Committee and Work Groups to eliminate barriers to CPI.
- **CPI Work Group:** Work Groups employ CPI tools to analyze the situation, identify ways to improve, seek approval for change, and executes process transformation.
- **CPI Peer Groups:** Peer Groups share common functional responsibilities and share information about CPI goals, challenges, approaches, activities, and accomplishments. (Deputy Secretary of Defense, 2006)

4. DOD CPITG Attachments

The DoD CPITG includes seven attachments that provide resources and tools to support CPI. They are listed:

- Resources
- Organizational Implementation Planning Framework
- Training and Certification
- CPI Progress Assessment
- CPI Toolbox
- Sample CPI Project Selection Criteria and Project Charter
- Terminology.

D. USMC CONTINUOUS PROCESS IMPROVEMENT GUIDEBOOK

On 19 December 2006, the Marine Corps Business Enterprise Office (MCBEO) disseminated the United States Marine Corps Continuous Process Improvement Program Guidebook Working Draft (USMC CPIPG) as a resource for use in designing and managing CPI efforts (MCBEO, 2006). This section provides a synopsis of the USMC CPIPG as part of an informed CPI foundation.

1. Introducing Continuous Process Improvement

The CPI Program comes at a critical time for the Marine Corps, which is facing a strategic imperative to maintain and enhance warfighting capability while confronting resource constraints that mandate affordability in all support operations. Every Marine Corps organization with responsibility for providing support to the warfighter is continuously working to improve that support. In order to assist these efforts, the Marine Corps CPI Program has been established. The primary purpose of the USMC CPI Program is to enhance all aspects of support provided to Marine Corps Operating Forces in order to maximize their combat readiness and warfighting capability. This enhanced support to the warfighter will be achieved by continuously improving all key support processes through application of process improvement tools to: 1) Reduce cycle times, 2) Provide optimum process reliability, 3) Ensure affordability, 4) Enhance support of warfighting mission readiness. This Marine Corps CPI Program Plan is aligned with the DoD CPI program and DoN process improvement guidance and translates DoD and DoN CPI guidance into

program plans that are compatible with the Marine Corps culture and environment. The Marine Corps CPI Program utilizes industry-recognized best practices and business improvement tools to enhance and effectively manage the performance of all business processes that support the warfighter. While affordability is an issue that must be addressed, the primary focus of the Marine Corps CPI Program is improving support to the warfighter, not cost reduction.

(MCBEO, 2006, p.3)

2. CPI Program Deployment and Structure

a. DoD, DoN, and USMC CPI Partnership

The Deputy Secretary of Defense promulgated the DoD CPITG on 11 May 2006 and established policy for the application of continuous process improvement throughout the Department of Defense (Deputy Secretary of Defense, 2006). The Secretary of the Navy issued a memo on 3 May 2006, announcing the implementation of a DoN-wide process improvement effort involving Lean Six Sigma (Secretary of the Navy, 2006). “The USMC CPI Program translates DoD and DoN CPI guidance into program plans that will enhance all aspects of the support provided for Marine Corps war fighting capability” (MCBEO, 2006, p. 4).

b. CPI Program Concepts

(1) DoD Core Business Missions. The core business missions that support warfighting across DoD are illustrated in Figure 3 of the previous section¹. The enterprise approach to process improvement is a fundamental concept in the current DoD and USMC CPI Programs.

(2) The Marine Corps Business Enterprise Supports the Warfighter. The High Impact Core Value Streams (HICVS) that comprise the Marine Corps Business Enterprise (MCBE) are illustrated in Figure 5. The Marine Forces Commands (MarFors) are the primary voice of the warfighting organizations that

¹ The DoD CPITG and the USMC CPIPG use the same figure to illustrate the DoD enterprise.

communicate the requirements of the Operating Forces (OpFors) to the Supporting Establishment (SE). The leaders of these organizations act as advocates of the High Impact Core Value Streams. They are responsible for managing and improving the performance of the value stream and act as CPI Champions. Their responsibilities are:

- Lead strategic planning to identify priorities
- Communicate the priorities to supported Commanders
- Appoint full-time CPI Managers serving on the USMC CPI Working Group
- Support value stream mapping to identify process performance gaps
- Initiate high impact CPI projects
- Implement and sustain process performance gains (MCBEO, 2006)

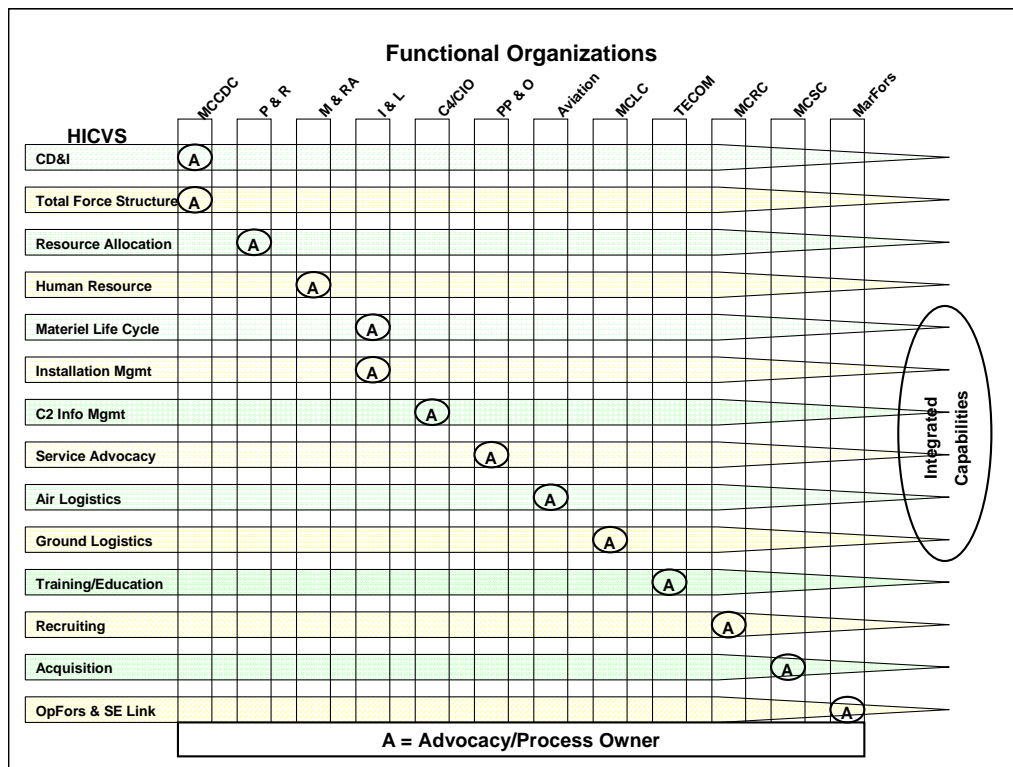


Figure 5. Marine Corps High Impact Value Streams (From MCBEO, 2006)

(3) USMC Process Improvement Efforts Are Aligned with DoD Business Modernization. Marine Corps HICVS are aligned with DoD Core Business missions, ensuring compliance with DoD Business Transformation efforts.

These transformation efforts include the Business Enterprise Architecture (BEA) that encompasses supporting business information systems, as shown in Figure 6.

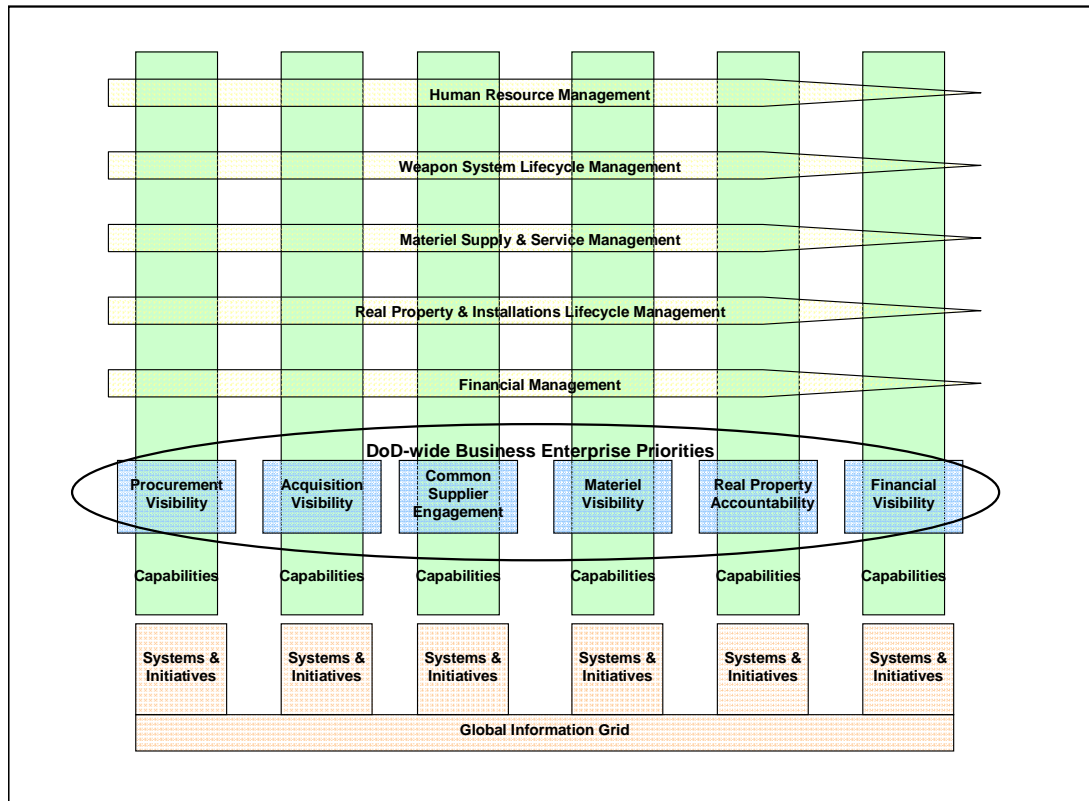


Figure 6. DoD Business Enterprise System Architecture (From MCBE0, 2006)

c. CPI Program Deployment

(1) CPI Program Deployment Strategy. The Marine Corps CPI Program strategy involves three integrated efforts:

- Coordinate CPI projects in the High Impact Core Value Streams by a single advocate
- Accelerate CPI efforts in USMC Air-Ground Logistics
- Execute High-Impact regional and organization-level CPI projects. (MCBE0, 2006)

(2) The DoD and USMC CPI Program Deployment Cycle. The Marine Corps CPI Program is aligned with DoD Program guidance. See Figure 4 in the previous section². The CPI deployment cycle steps are the same for DoD and the USMC except that step five is delineated as the implementation step in the USMC CPIPG. The Deployment Cycle steps are listed:

- Step 1: Develop Mission, Vision, and Strategic Plan
- Step 2: Conduct value stream analysis
- Step 3: Develop structure and behavior
- Step 4: Align and deploy goals
- Step 4A: Create and refine Operational Plan
- Step 4B: Implement Operational Plan
- Step 4C: Monitor
- Step 4D: Focus on CPI
- Step 5: Program Implementation. (MCBEO, 2006)

d. Key Roles and Responsibilities

The management structure of the Marine Corps CPI Program is designed to engage key leaders in implementation. The DoD and USMC (MCBEO, 2006) have adopted standard CPI roles that are common to all industries:

- Champion. The Commandant and Assistant Commandant of the Marine Corps are the executive-level Champions responsible for driving the CPI Program.
- Other Champions and CPI Project Sponsors. The leaders of the major organizations act as advocates and owners of the High Impact Value Streams. They lead CPI within their respective organizations and designate a CPI Manager, who serves as a member of the USMC CPI Working Group, and is responsible for CPI Program deployment.
- CPI Steering Groups. The Marine Corps CPI Program utilizes three steering groups: Marine Corps Resources Oversight Council (MROC); Marine

² The DoD CPITG and USMC CPIPG use the same figure to depict the DoD Deployment Cycle.

Corps Business Transformation Executive Steering Group (BTESG); Marine Corps CPI Working Group.

- MROC. The MROC is chaired by the Assistant Commandant of the Marine Corps and is composed of the leaders of the major organizations. The MROC is responsible for CPI Program policy development and oversight.
- BTESG. The Marine Corps Business Transformation Executive Steering Group is composed of key Marine Corps Senior Executive Service members and supports the MROC in oversight of the CPI Program. The roles of the BTESG are to: develop and implement strategies; assist in coordination of HICVS improvement efforts; monitor performance and provide business focus.
- Marine Corps CPI Working Group. The CPI Working Group is composed of 0-6/GS-15 level representatives that represent all major functional areas of the Marine Corps Business Enterprise. The CPI Working Group performs the following functions: translate guidance into deployment plans; support program communication plans; identify CPI project candidates; assist integration of CPI projects; support implementation and sustainment of project results; support implementation of tools and training; support dissemination of CPI best practices, and lessons learned.
- DC, I&L. The DC, I&L provides general program management support which includes training through the MCBEO and CPI Support teams.
- Director MCBEO. The Director MCBEO acts as Deployment Director of the Marine Corps CPI Program. The position approves implementation plans while working with the BTESG and the CPI Working Group.
- Introductory Level Personnel. All personnel complete introductory online training when assigned to a CPI project team. There is no certification associated with this training. See Figure 7 for USMC CPI certification levels. (MCBEO, 2006)

Figure 7 presents the certification levels of CPI trained practitioners.

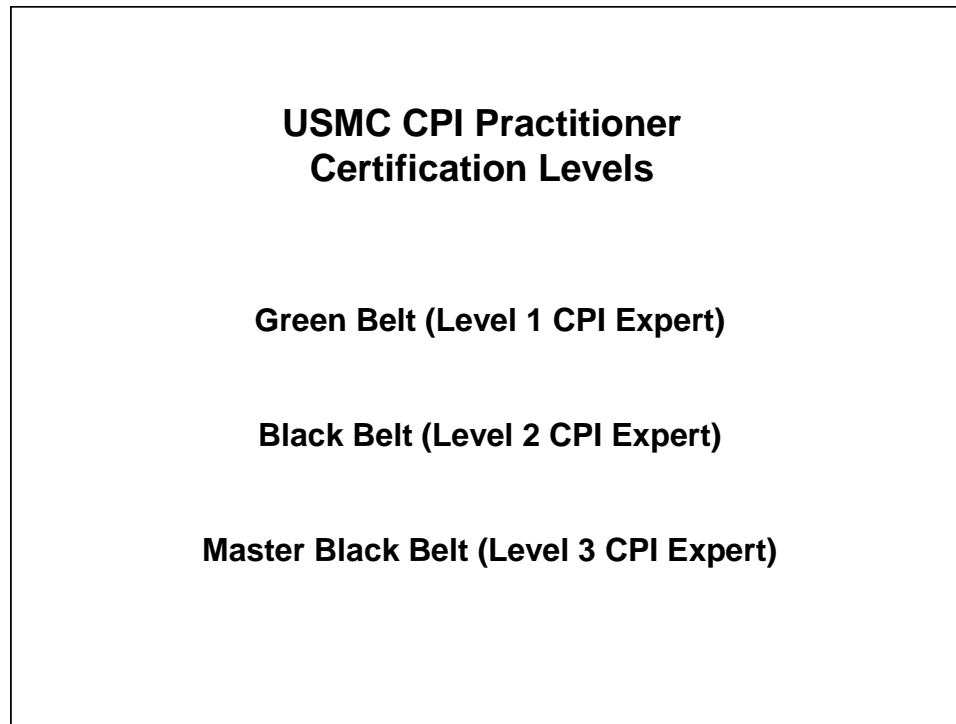


Figure 7. USMC CPI Practitioner Certification Levels (From MCBE0, 2006)

- **Green Belt.** Green Belts are functional subject matter experts that serve part-time on CPI project teams. Green Belts may lead CPI project teams or may serve on teams that are led by Black Belts. Green Belts are certified as Level 1 CPI Experts.
- **Black Belt.** Black Belts are certified as Level 2 CPI Experts and hold full-time positions responsible for leading CPI projects. These experts are highly skilled in the use of integrated business tools and methodologies, and are proficient in facilitation and change management.
- **Master Black Belt.** Master Black Belts are certified as Level 3 CPI Experts and hold full-time positions responsible for providing certification, training, and technical support to the Marine Corps CPI Program. Master Black Belts are chosen for their ability to teach and mentor all CPI practitioners. (MCBE0, 2006)

e. USMC CPI Program Structure

The USMC CPI Program structure is depicted in Figure 8.

f. Program Implementation

The first four steps of the CPI Program Deployment Cycle set the foundation for implementation. The leaders of the major organizations that manage the High Impact Core Value Streams sponsor process improvement projects. They initiate projects by issuing project charters that specify expected benefits and results. They also support implementation and sustainment of the improvements. CPI tools are applied to improve capability and performance while assuring affordability.

(1) Process Improvement Tools. Marine Corps CPI (MCBEO, 2006) uses recognized best practices and tools:

- **Strategic Planning.** The strategic plan portrays a comprehensive roadmap for an organization to set goals and targets for completing its mission.
- **Lean Six Sigma.** Lean Six Sigma combines the strategies of Lean and Six Sigma to eliminate waste, improve speed, and reduce variation.
- **Activity-Based Cost Management.** Activity-based cost management provides resource allocation information about processes in a manner that permits comparative analysis of inputs, consumption, and outputs.
- **Theory of Constraints.** Theory of Constraints provides a set of analytical tools for analyzing interrelated processes to improve overall system capability.
- **Balanced Resource Management.** There are three resources available to any organization: financial capital, physical assets, and intellectual capital. The key elements of balanced resource management are identifying budget and manpower requirements; effective budget execution that aligns with strategic priorities; and process improvement.
- **Extended Enterprise management.** Extended enterprise management extends process analysis, improvement, and management to all components of the organization as well as outside entities that contribute to delivering products and services.
- **Integrated Performance Management (IPM).** IPM links organizational objectives between levels and across the processes of an organization to drive continuous improvement. (MCBEO, 2006)

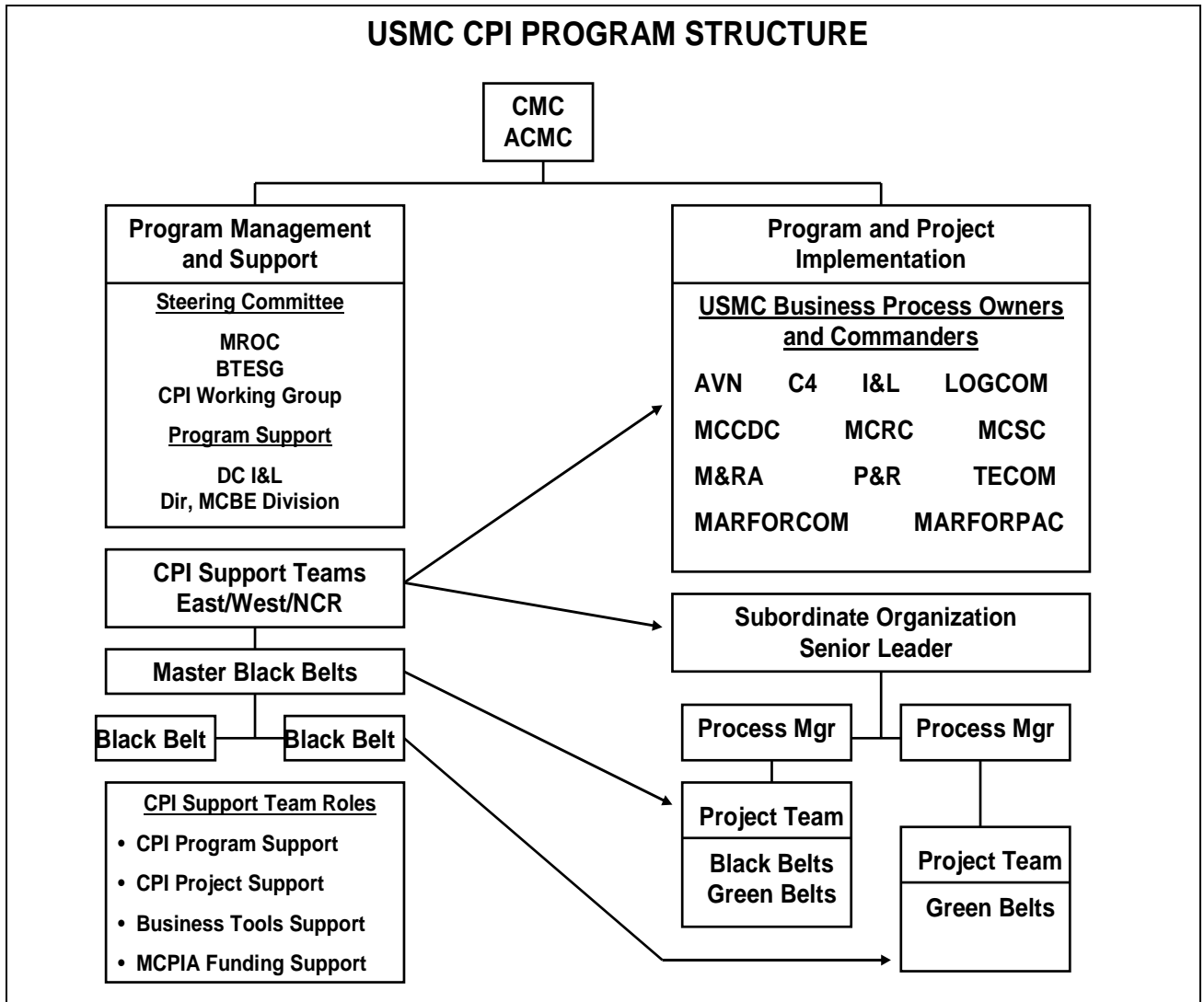


Figure 8. USMC CPI Program Structure (From MCBEO, 2006)

(2) Cost Savings Associated with the Marine Corps CPI Program.

“While affordability is an issue that must be addressed, the primary focus of the Marine Corps CPI Program is improving support to the warfighter, not cost reduction” (MCBEO, 2006, p. 16). The CPI Program manages existing financial pressure while maintaining support to the warfighter. HQMC will provide initial program funding for the first three years, then become self-financing.

(3) Assessment of CPI Program. Three tools used to measure the success of the program:

- CPI Program Plan Scorecard
- MCBE Process Performance Scorecard
- DoN Organizational Performance Assessment Guide. (MCBEO, 2006)

(4) Program Deployment Actions. A three year CPI action plan was developed for the Marine Corps CPI Program. The CPI Three Year Action Plan addresses requirements to improve high impact core processes, training and education and the leadership required to support the program through 2008.

3. CPI Program Strategic Plan

a. Mission

To enhance all aspects of the support provided to Marine Corps Operating Forces to maximize their combat readiness and warfighting capability. The CPI Program accomplishes this by promoting continuous process improvement of all support processes through application of process improvement tools to reduce cycle times, optimize process reliability, and provide affordability.

(MCBEO, 2006, p. 17)

b. Vision

All business operations and processes that provide support to the Operating Forces are continuously improved in a fully integrated manner across the extended enterprise. This provides highly effective support to the combat readiness and warfighting capability of the Marine Corps at an affordable cost. Continuous improvement of all support operations, in consultation with supported organizations and personnel, is an established part of the leadership and management culture of the Marine Corps.

(MCBEO, 2006, p. 17)

c. Guiding Principles

- The primary goal is to support the warfighter
- Make continuous improvement of all support processes the primary focus
- Advocate teamwork throughout the extended enterprise
- Be receptive to new CPI concepts and tools as they evolve (MCBEO, 2006, p. 17)

d. Strategic Themes

(1) Support of Combat Readiness and Warfighting Capability. The purpose of the CPI Program is to enhance the support provided to Marine Corps Operating Forces in order to maximize their combat readiness and warfighting capability. (MCBEO, 2006)

(2) Management Excellence. Continuous improvement of support processes will reduce cycle times, provide optimum reliability, and ensure affordability. CPI must be integrated across the extended enterprise to achieve optimum results. (MCBEO, 2006)

e. Strategic Goals

- Conduct successful CPI projects
- Establish strong program infrastructure
- Provide skills development and training
- Create an enduring culture of continuous improvement (MCBEO, 2006, p. 17)

4. USMC CIPG Attachments

The USMC CIPG includes ten attachments that provide supporting plans, resources, and tools to support CPI. They are listed:

- CPI Program Plan Scorecard
- Glossary of Terms
- CPI Three Year Action Plan
- CPI Program Training Plan

- CPI Program Communication Plan
- CPI Program Risk Mitigation Plan
- USMC CPI Expert Qualification Requirements
- USMC Strategic Planning Model
- CPI Project Selection Guide
- References

E. SIX SIGMA

As a statistical term, sigma refers to the standard deviation of a process about its mean. In a normally distributed process, 99.99966% of measurements will fall within +/- 4.5 sigma. In a manufacturing process, this translates into 3.4 defects per million opportunities. Motorola noted that many manufacturing operations tended to shift 1.5 sigma over time, so a process with a normal distribution and normal variation would need specification limits of +/- 6 sigma in order to produce less than 3.4 defects per million opportunities (Wortman et al., 2006). Six sigma quality is a target that world class organizations strive to achieve.

As a process improvement methodology, Six Sigma focuses on reducing variation in a process to deliver near-perfect products consistently. Motorola developed Six Sigma as a key business initiative in 1987. Dr. Mikel Harry, who led the corporate effort there, eventually left and founded the Six Sigma Academy, with the purpose of accelerating corporations' efforts to achieve world class standards (Harry, 1998). Motorola credits the Six Sigma initiative for savings of \$940 million over three years (Hahn, Hill, Hoerl and Zinkgraf, 1999).

The steps to Six Sigma: (Hahn, Hill, Hoerl and Zinkgraf, 1999)

- Define
- Measure
- Analyze
- Improve
- Control.

1. Define

The initial step is defining the problem. “Properly defining the problem is the most important part of solving the problem” (Wortman et al., 2006, p. V-2). Wortman et al (2006) provides the following tools useful in the definition step:

- Project charter
- Stakeholder analysis
- Defining the customer
- Pareto diagrams
- SIPOC
- Rolled throughput yield
- Voice of the customer
- Affinity diagrams
- Kano model
- Process flow charts

a. SIPOC Diagram

The SIPOC diagram (Suppliers, Inputs, Processes, Outputs, Customers), displayed in Figure 9, is a technique for Six Sigma management. SIPOC is an acronym for the five major elements in the diagram. SIPOC visually aids the customer to “see” the business from an overall process perspective by:

- Displaying cross-functional activities in simple diagrams (process flow charts)
- Providing a framework applicable to processes of all sizes
- Helping maintain the big picture business perspective
- Providing methods for adding additional detail as needed. (Wortman et al., 2006)

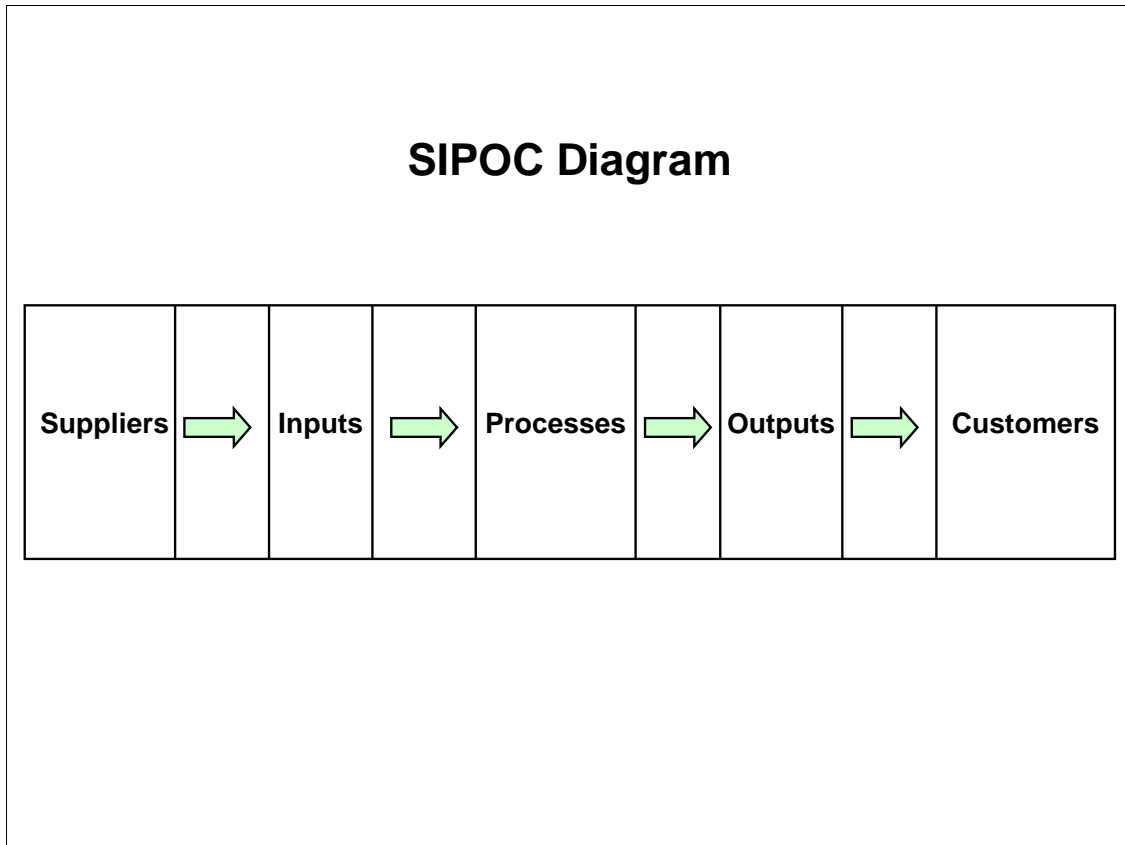


Figure 9. SIPOC Diagram (From Wortman et al., 2006)

b. Voice of the Customer

Understanding the needs of the customer is critical for mission accomplishment. This comprehension is achieved by listening to the Voice of the Customer (VOC). Rath and Strong (2000) suggest a process for collecting VOC data:

- Identify customers and their needs
- Collect and analyze data
- Convert data into customer needs
- Sort out what is most important to the customer, the critical-to-quality characteristics
- Obtain specifications from the critical-to-quality characteristics.

c. Project Charter

The project charter is a document that defines a process improvement team's mission, scope, and objectives. Moen (1991) suggests that a project charter should contain:

- Business case
- Problem statement
- Project scope
- Goal statement
- Roles
- Milestones
- Resources

2. Measure

In the Measure step, a data collection plan is developed. A process must be measured before it can be improved. The process can be modeled using tools such as flow charts and process maps (Wortman et al., 2006). Once input and output process variables have been identified, their relationships can be determined using tools such as relational matrices and cause-and-effect diagrams (Wortman et al., 2006). Cause-and-effect diagrams (CED) are also known as fishbone diagrams. Fishbone diagrams break problems into smaller pieces and display possible root causes in a graphical manner. The 5-M and E (manpower, material, method, machine, measurement and environment) version of a fishbone diagram is common (Wortman et al., 2006). Figure 10 depicts a basic fishbone diagram.

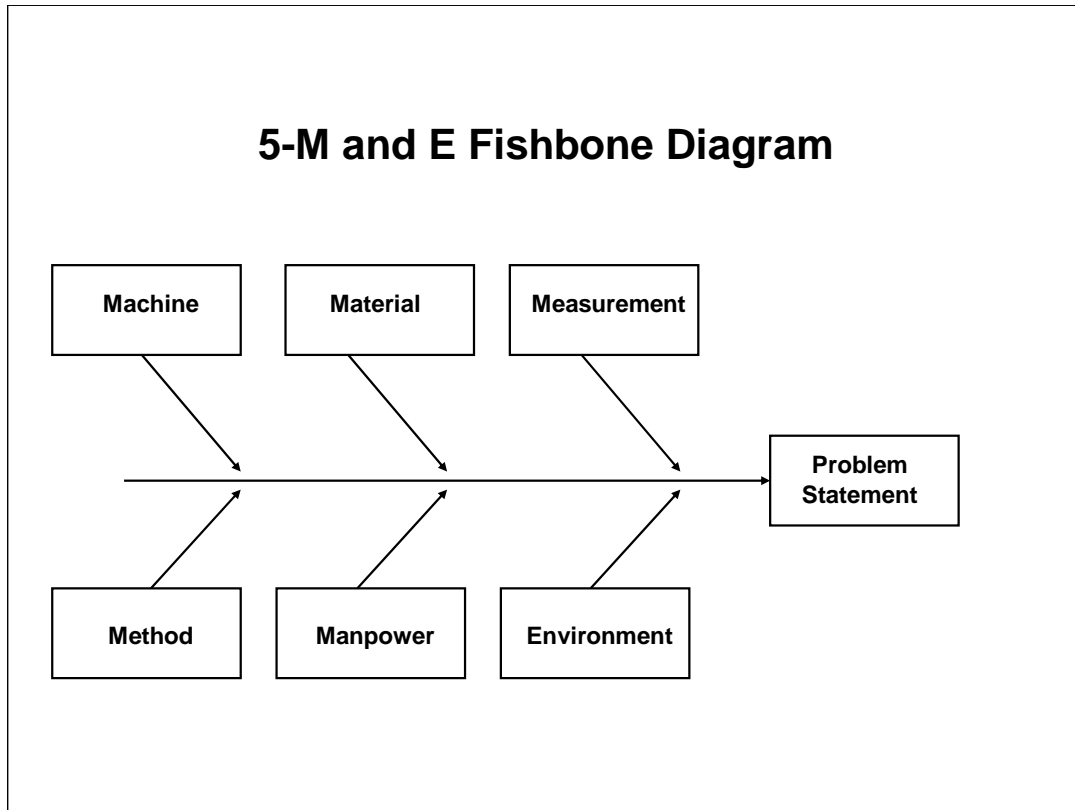


Figure 10. Fishbone Diagram (From Wortman, 2006)

3. Analyze

In the Analyze step, data is reviewed to determine the root causes of the identified problems. Failure Modes and Effects Analysis (FMEA) and Cause and Effects (CED) diagrams are useful tools at this step.

4. Improve

In the Improve step, solutions and implementation plans are developed and deployed to improve the applicable processes.

5. Control

In the Control step, the improved processes are monitored to prevent them from reverting back to their original form.

F. LEAN

The first person to truly integrate an entire production process was Henry Ford. At Highland Park, MI, in 1913 he married consistently interchangeable parts with standard work and moving conveyance to create what he called flow production.

Ford lined up fabrication steps in process sequence wherever possible using special-purpose machines and go/no-go gauges to fabricate and assemble the components going into the vehicle within a few minutes, and deliver perfectly fitting components directly to line-side. This was a truly revolutionary break from the shop practices of the American System that consisted of general-purpose machines grouped by process, which made parts that eventually found their way into finished products after a good bit of tinkering (fitting) in subassembly and final assembly.

As Kiichiro Toyoda, Taiichi Ohno, and others at Toyota looked at this situation in the 1930s, and more intensely just after World War II, it occurred to them that a series of simple innovations might make it more possible to provide both continuity in process flow and a wide variety in product offerings. They therefore revisited Ford's original thinking, and invented the Toyota Production System. This system in essence shifted the focus of the manufacturing engineer from individual machines and their utilization, to the flow of the product through the total process.

Toyota concluded, that by right-sizing machines for the actual volume needed, introducing self-monitoring machines to ensure quality, lining the machines up in process sequence, pioneering quick setups so each machine could make small volumes of many part numbers, and having each process step notify the previous step of its current needs for materials, it would be possible to obtain low cost, high variety, high quality, and very rapid throughput times to respond to changing customer desires.

(Lean Enterprise Institute Website, 2007, History section)

The term Lean Production was first coined by Womack, Jones and Roos (1991) in their best seller, *The Machine that Changed the World*. The book chronicles the transition of automobile manufacturing from craft production to mass production to lean production.

(Apte, 2006)

A rough chronology of lean production systems is presented:

- 1800's Craft to mass production
- 1950's Toyota Production System (TPS)
- 1980's Expansion of TPS outside of Toyota
- 1990's Lean Enterprise and Six Sigma
- 2000's Lean Six Sigma.

Lean techniques are, in their most basic form, the systematic identification and elimination of wastes, the implementation of the concepts of continuous flow, and customer pull. Central to the foundation of lean thinking, is the concept that value is defined by the customer.

(Wortman et al., 2007, p. II-11)

A large number of lean improvement techniques are widely used by organizations today. Some of the more common processes include:

- Minimization of non-value added activities (muda)
- Decreased cycle times
- Single minute exchange of dies (SMED)
- Set-up reduction (SUR)
- Standard operating procedures
- Visual displays for workflow and communication
- Total productive maintenance
- Poka-yoke techniques to prevent errors
- Motion study and material handling
- Systems for workplace organization (5S approach)
- Just-in-time principles
- Kaizen methods
- Continuous flow manufacturing concepts
- Value stream mapping. (Wortman et al., 2006, p. III-10)

1. Minimization of Non-Value Added Activities (Muda)

Non-value-added activities are classified as muda. Muda is a word for waste. Work is applied at each step in a process. The activities that are useful to the customer are considered value-added; the other activities are considered non-value-added (Wortman et al., 2007). Imai (1997) provides seven categories of waste:

- Defects
- Over production
- Waiting
- Transportation
- Inventory
- Motion
- Extra processing.

2. Decreased Cycle Time

Cycle time is the amount of time required to complete one step in a process (Wortman et al., 2006). Reducing non-value-added activities during a process step or eliminating non-value-added steps, and reducing the seven common wastes, will decrease the total time of a process.

3. Poka-yoke

Poka-yoke is a term that means mistake proofing. It is a technique to prevent the opportunity for errors to be made that will cause a defect. An example: A physical device on a machine that only allows raw material to be inserted in the correct manner, thus eliminating the possibility of a worker inserting the material incorrectly, leading to defective products.

4. Systems for Workplace Organization (5S)

5S is a fundamental first step for any manufacturing company wishing to call itself world class. The presence of a 5S program is indicative of the commitment of senior management to workplace organization, lean manufacturing, and the elimination of muda (Japanese for waste). The 5S

program mandates that resources be provided in the required location, and be available as needed to support work activities.

(Imai's book as cited in Wortman et al., 2006, p. III-18)

5S stands for:

- Sort: Separate what is not needed and eliminate it
- Straighten: Everything has a place and everything in its place
- Shine: Make the workplace spotless
- Standardize: Establish a routine for the first three steps
- Sustain: Commit to steps one through four. (Wortman et al., 2006)

5. Value Stream Mapping

A value stream map is created to identify all of the activities involved in product manufacturing from start to finish. This value stream may include suppliers, production operations and the end customer. For product development, value stream mapping includes the design flow from product concept to launch. The entire system is viewed for improvement opportunities.

(Rother and Shook's book as cited in Wortman et al., 2006, p. III-13)

Benefits of a value stream map include:

- Seeing the complete process flow
- Identifying sources and locations of waste
- Providing common terminology for process discussions
- Helping to make decisions about the flow
- Tying multiple lean concepts and techniques together
- Providing a blueprint for lean ideas
- Showing the linkage between the information and material flows
- Describing how the process can change
- Determining effects on various metrics (Rother and Shook's book as cited in Wortman et al., 2006, p. III-13)

The value stream mapping process is shown in Figure 11.

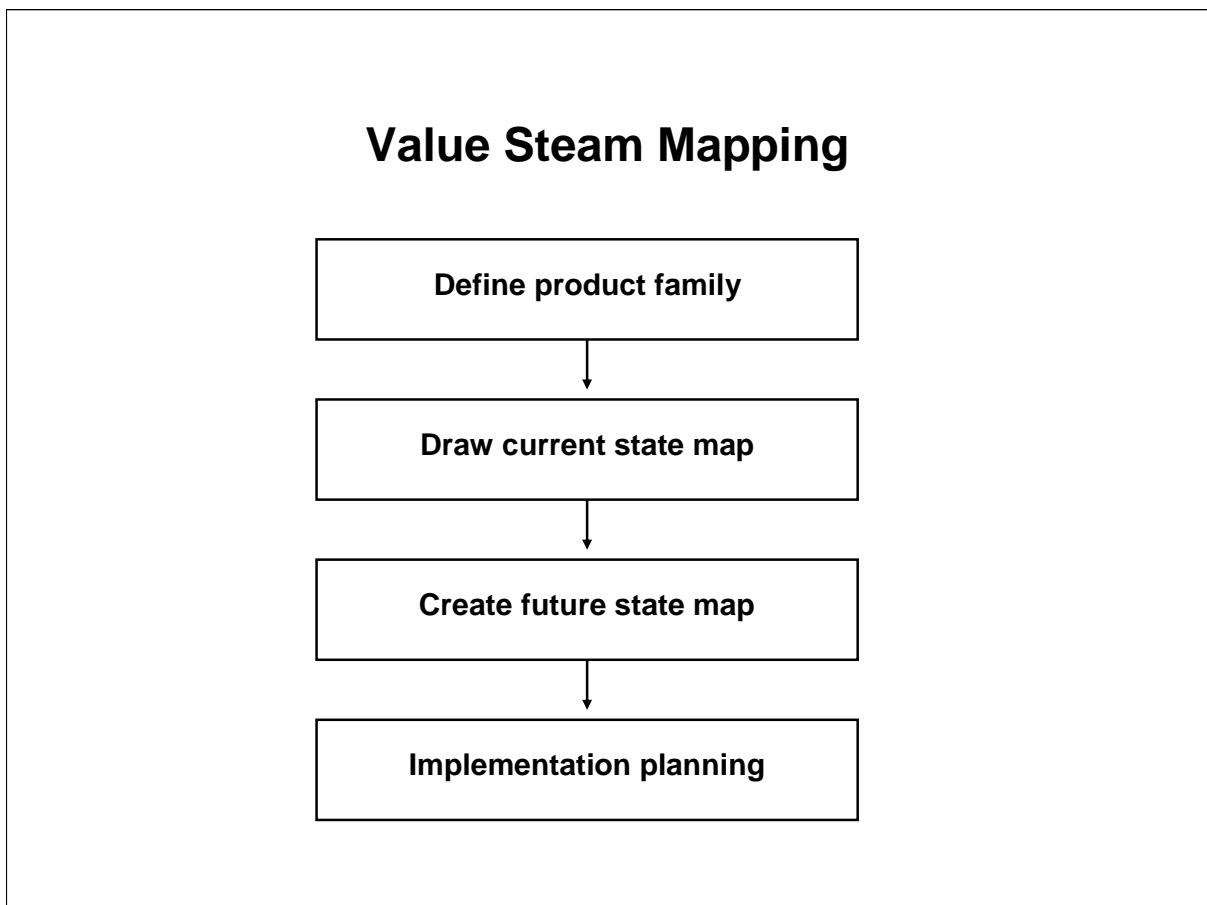


Figure 11. Value Stream Mapping Process (From Wortman et al., 2006)

An example of a simple value stream map is depicted in Figure 12.

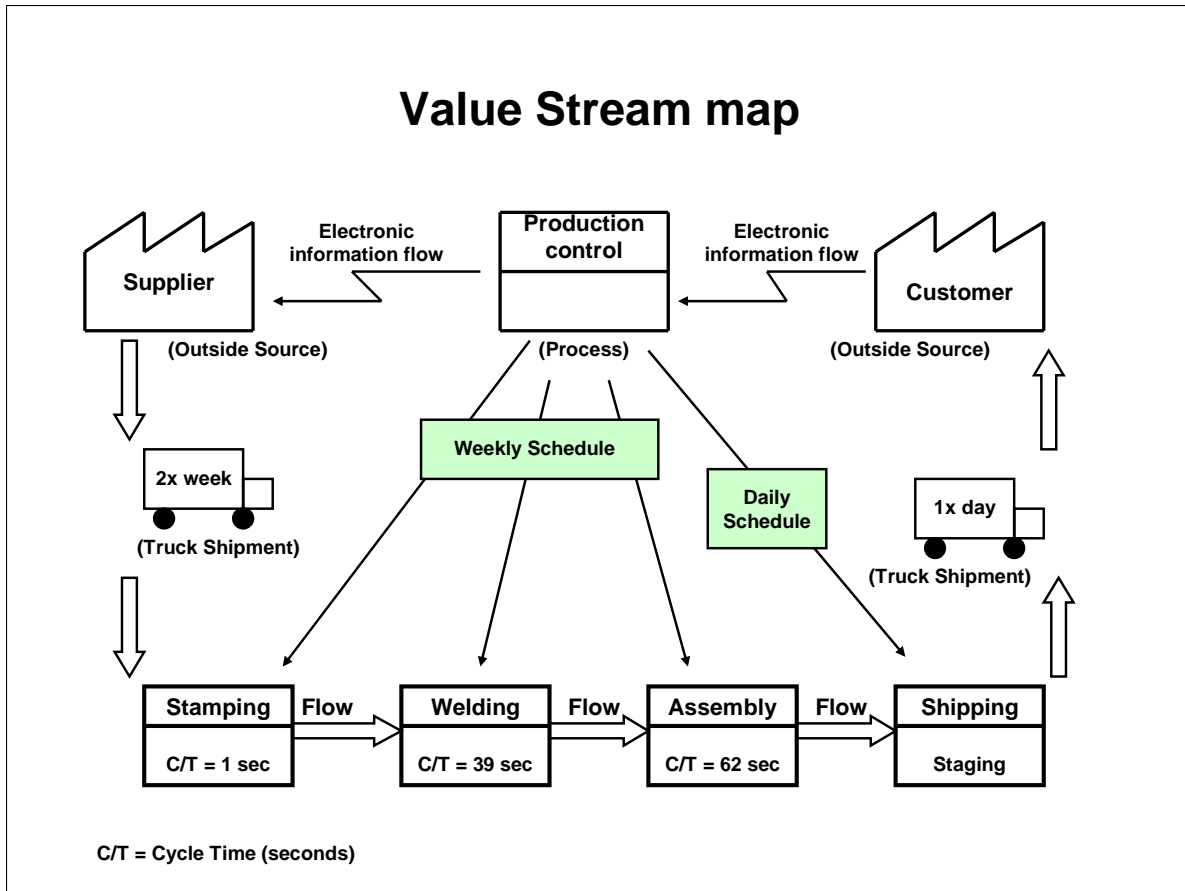


Figure 12. Value Stream Map Example (After Rother and Shook, 2003)

G. LEAN SIX SIGMA

Both six sigma and lean focus heavily on satisfying customers. Six sigma makes customers the primary driver for action in a “war on variation” and identifies opportunities that promise a large, fairly immediate, financial reward. Lean considers customer inputs and conducts a “war on waste.

(Wortman et al., 2007, p. II-3)

Combining Lean and Six Sigma concepts into one process improvement methodology provides a combined toolbox of techniques that can be applied to an organization’s or project team’s specific situation. A Lean Six Sigma improvement project uses the underlying Six Sigma foundation of DMAIC as the project team’s

roadmap, but can draw from the techniques of any other process improvement methodology, i.e., Lean, to accomplish the tasks required for each of the steps.

H. THEORY OF CONSTRAINTS

The theory of constraints (TOC) is an operating process developed by E. Goldratt, introduced in his book titled *The Goal* (Goldratt, 1986). TOC is a way of thinking that aims to continually achieve more of the goal of a system. If that system is a for-profit business, then the goal becomes one of making more money (Goldratt, 1986). *The Goal* reminds readers that the three basic measures to evaluate a system are throughput, inventory, and operational expense (Wortman et al., 2007).

Some important concepts of TOC are bottleneck resources, balancing flow with demand, and dependent events. Bottleneck resources are resources that have less capacity than the demand requires (Goldratt, 1986). TOC is based on the theory that all revenue generation, regardless of the product, is limited by at least one constraining process. Only by increasing flow at the bottleneck process can overall throughput be increased (Goldratt, 1986). Balancing flow with demand means to balance the flow of product through the system with the demand (Goldratt, 1986). Dependent events refer to the fact that subsequent events depend on the events prior to it (Goldratt, 1986).

Goldratt (1990) recommends that the following five step method be used for the implementation of TOC:

- Identify the system's constraints
- Exploit the constraint
- Subordinate everything else to the constraint
- Elevate the system's constraints
- Go back to the first step and identify the next constraint.

TOC can be employed on its own or in conjunction with Lean Six Sigma. It is another tool that can be added to the process improvement toolbox. For example, if it was discovered during a step in the DMAIC process of a Lean Six Sigma project, that the

root cause of a problem was a bottleneck, then the TOC approach could be utilized to implement a solution. The methodologies of Lean and Six Sigma and TOC are complementary. Table 1 shows a comparison of the three methodologies.

Table 1. Comparing Six Sigma, Lean and TOC (From Nave, 2002)

Program	Six Sigma	Lean Thinking	Theory of Constraints
Theory	Reduce variation	Remove waste	Manage constraints
Application	1) Define	1) Identify value	1)Identify constraint
	2) Measure	2)Identify value stream	2) Exploit constraint
	3) Analyze	3) Flow	3)Subordinate processes
	4) Improve	4) Pull	4) Elevate constraint
	5) Control	5) Perfection	5) Repeat cycle
Focus	Problem focused	Flow focused	System constraints

Nave (2002) finishes his comparison of the three processes by stating:

For Six Sigma: If we focus on reducing variation, then we will have more uniform process output. For Lean: If we focus on waste removal, then flow time will improve. TOC: If we focus on constraints, then throughput volume will improve. For Six Sigma, focus on reducing variation and achieving uniform process results in less waste, less throughput time and less inventory. For lean thinking, focus on waste and flow time results in less variation, uniform output and less inventory. For TOC, focus on constraints and increased throughput results in less inventory and a different accounting system.

(Nave, 2002, p. 78)

III. ORGANIZATION AND ACTIVITIES AT RCO-SW

A. RCO-SW BACKGROUND

The RCO-SW is a component of the installation and management HICVS. The DC I&L is the process owner. “The RCO-SW exists to provide base and tenant activities supplies and services not found in the Federal Supply System” (RCO-SW, 2004, p.4)

The strategy of the RCO-SW is supported by two primary operational missions:

Primary: To provide supplies and services to Marine Corps Base Camp Pendleton, tenant commands and activities, and all bases, camps, post & recruiting districts within the MCI West region not available through normal supply channels (RCO-SW Website, 2007).

Secondary: To train, develop, and support all USMC military enlisted MOS 3044 & officer MOS 9656. This includes training and supporting the “Contingency Contracting Force” (CCF) that is tasked with procurement support to deploying units through advances operational planning and deployment of Contract Specialists throughout the world. (RCO-SW, Website, 2007)

B. CONTRACTING PROCESS

The contracting process is an intricate compilation of activities. Many factors including request procedure complexity, regulations, contract type, cost, and time constraints dictate the number of steps involved. Figure 13 provides a visual depiction of the actual flow of a requested item.

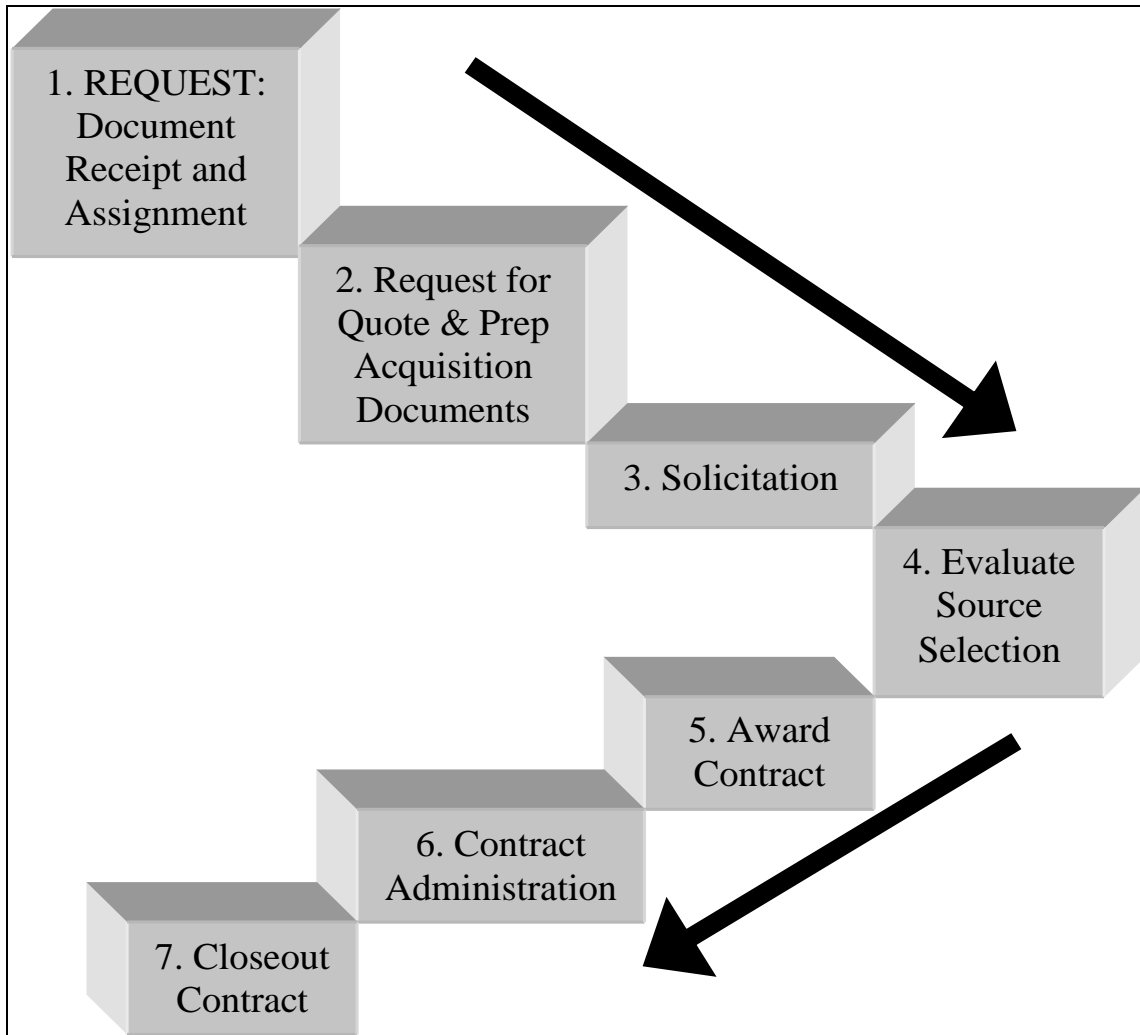


Figure 13. The Contractual Process Flow (From RCO-SW, 2004)

C. RCO-SW

Acquisitions of supplies and services exceeding \$100,000 are processed by the Formal Branch and referred to as large contracts. Acquisitions in the amount less than \$100,000 are processed by the Simplified Acquisition Procedures (SAP) Branch. The Business Clearance Memorandum (BCM) is a requirement for all contract actions exceeding \$100,000. The BCM is the Contracting Officer's instrument to demonstrate the fulfillment of statutory and regulatory responsibilities. Large contracts are processed by the Formal Branch in compliance with the BCM. The Formal and (SAP) branches are

primarily staffed by civilians and work for a civilian director. The civilian staff provides the permanent structure that fulfills the primary operational mission of the RCO-SW. (RCO-SW, 2004)

The remaining element of the RCO-SW is composed of Marines. The Contingency Contracting Office (CCO) Marine Officers are graduates of the Naval Postgraduate School's Contracting and Acquisition Curriculum. The enlisted Marines are selected from various backgrounds and receive no formal contracting training before placement in the RCO. The CCO is tasked to provide training and procurement support to deployed units. This support is provided through advanced operational planning and deployment of Warranted Contracting Officers throughout the world. Only a warranted contracting officer can obligate the U.S. Government through contracting activities. The warranting authority is derived from the Assistant Deputy Commandant, Installations and Logistics (ADC, I&L) (Contracts). The authority chain is depicted below in Figure 14.

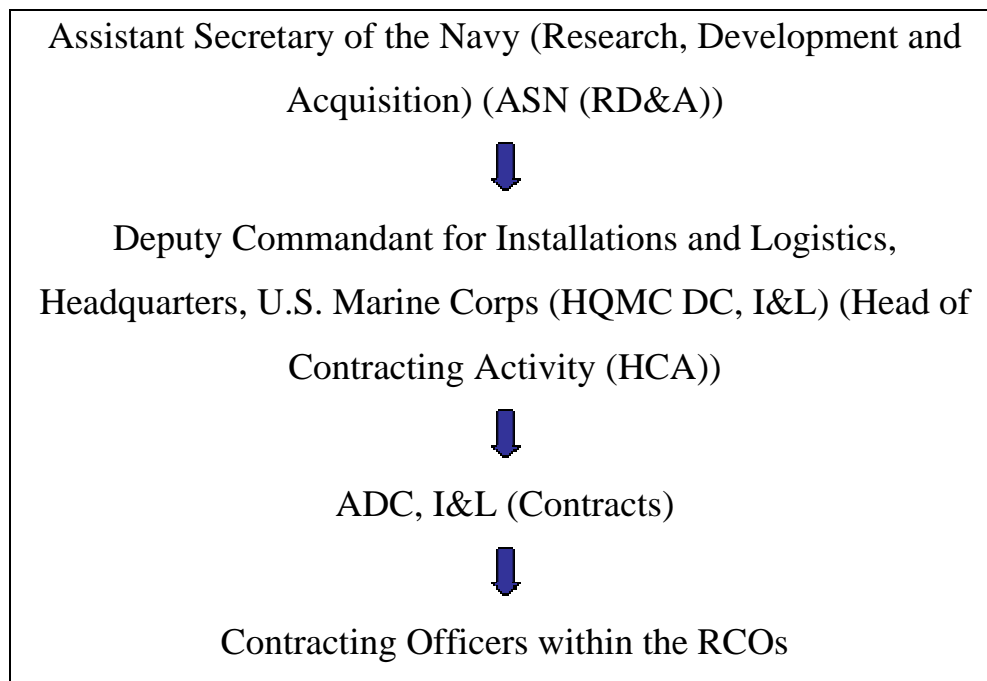


Figure 14. Authority Delegation (After CMPG Website, MAPS section, 2007)

Contingency contracting facilitates procurement of vital supplies and services needed to maintain deployed forces. Contingency contracting is primarily utilized during armed conflict to supplement logistical requirements of U. S. forces. Examples would be the purchase of lumber in Bosnia and gravel in Iraq.

D. CUSTOMER

For open market purchases in excess of \$25,000 dollars, the RCO-SW provides acquisition support to the base and tenant commands located at Camp Pendleton, Marine Corps Recruit Depot San Diego, Marine Corps Mountain Warfare Training Center, Bridgeport, Marine Corps Logistics Base Barstow, Marine Corps Air Station Miramar, and Marine Corps Air Station Yuma.

The most important tenants are: First Marine Expeditionary Force (I MEF), First Marine Logistics Group (I MLG), First Marine Division (I MarDiv), and Third Marine Aircraft Wing (III MAW). I MLG, I MarDiv, and III MAW are the highest level combat commands for the Marine Corps stationed on the West coast. They collectively fall under the command of I MEF. III MAW is headquartered approximately fifty miles south at Marine Corps Air Station Miramar.

I MEF, I MLG, I MarDiv, and III MEF are the primary combat customers for the RCO-SW. These commands delegate spending authority to lower level units, however, retain final approval for all expenditures. DoD directives to outsource services in Iraq and Afghanistan have merely compounded an already complex support situation. Consequently, the RCO-SW's workload has increased without an increase in manpower.

Bases and installations require more RCO support as base operational services (BOS) are outsourced. Customer frustration results from RCO-SW's inability to provide specialized training to the customer in contracting and acquisition. The problem is exacerbated by Internet-based technologies designed to augment the acquisition process. Customers often complain that the technologies are not intuitive and often result in unnecessary delays in delivery of goods and services. The RCO-SW conducts its contract management and contract solicitation with customers through the following automated tools (AFCEP 2007, p. 1-1):

- PR Builder³. This tool automates the process by which a Purchase Request (PR) is generated and routed between the originator and contracting communities (AFCEP, p.1-5).
- Procurement Desktop-Defense (PD2). PD2 provides automated strategic, streamlined contract management support for the procurement professional within a complete workflow management solution (AFCEP, p. 12-17).
- Federal Business Opportunities (FedBizOpp). FedBizOpp is the single government point-of-entry (GPE) for Federal Government procurement opportunities over \$25,000 (AFCEP, p. 22-1).
- Navy-Electronic Commerce On-line (NECO). NECO is a low cost, easily accessible Internet-based system for the Navy (and Marine Corps) to conduct Electronic Commerce (CMPG Website 2007, p. 1.9.3)
- Wide Area Workflow (WAWF). WAWF allows vendors and government users to submit invoices and receiving reports (DD250s) electronically. All vendors contracting with the Marine Corps must submit all payment requests via WAWF (AFCEP p. 29-1).
- Navy Air Force Interface (NAFI). Interface to DoD Electronic Document Access (EDA) providing simple, efficient, electronic access to executed procurement instruments: contracts, delivery orders, modifications, etc., to the Defense Finance Accounting Service (DFAS), the Defense Contract Management Agency (DCMA) and the Department of Defense (DoD) users. Access is restricted to Government agencies (AFCEP p. 26-1, 2).

Combat commands are the focus of effort and are supported at all costs. The deficiencies in the technological interface with the customer have drawn considerable attention from Headquarters Marine Corps (HQMC).

Manpower protocol adds a confusing dimension to the relationships with the customer. I MEF and I MLG assign Marines to the RCO-SW. This action results in ownership issues between the RCO-SW and the Commands. The Marines are housed at the RCO-SW while in garrison, however, problems arise with the current arrangement because the individual Marine remains under the administrative and

³ The Procurement Request Builder (PR Builder) is accessible via the Internet and is the Marine Corps' primary method of creating, routing for approval, and applying funding to a purchase request (PR) to obtain goods or services. Once received in the contracting office, PR's must be reviewed for accuracy. Each office establishes minimum standards for requirements data, which must be included as a part of each PR to be considered adequate. If a PR is determined to be inadequate for procurement action, it is returned to the requiring activity (customer requesting the action) for modification or cancellation. Upon a determination of adequacy, contracting office personnel will record both the date and time the actionable purchase request was received in the contracting office for processing.

operational control of their respective parent commands: either I MEF or I MLG. In the resulting chaos, the RCO-SW director lacks ultimate control of the RCO-SW Marines. This ownership dilemma is exacerbated by additional training requirements such as marksmanship and guard duties. Consequently, the RCO-SW director cannot plan for the presence of the RCO Marines when planning work distribution. This situation diminishes the opportunities for RCO Marines to develop critical, basic contracting proficiency. In extreme cases Marines are physically assigned with their parent command as contracting representatives but are task-saturated with numerous, unrelated collateral duties precluding the possibility of performing actual contracting activities. This chain of events degrades the mission capability of both the parent command and the RCO-SW.

E. COMMAND STRUCTURE

In the Marine Corps, administrative and operational control is referred to respectively as ADCON and OPCON. The RCO-SW currently falls under the ADCON and OPCON of the commanding general for Marine Corps Installations West (CG MCIW) (Marine Corps Installations West Website, 2007). MCIW controls all Marine Corps Installations in the western United States. The RCO-SW Director works for the CG MCIW, yet is subject to regulation, policy, and guidance from HQMC. Marine Corps Installations-West prescribes to the following stated mission and vision:

Mission:

Marine Corps Installations West implements policies, develops regional strategies and plans, prioritizes resources, and provides services, direction and oversight through assigned U.S. Marine Corps Installations, in order to support the Operating Forces, tenant commands and activities.

(MCIW, Website homepage, 2007)

Vision:

Marine Corps Installations West will provide Operating Forces and tenant commands with the highest quality of continuous, effective service and support to satisfy present and anticipate future joint and expeditionary warfare requirements.

(MCIW, Website homepage, 2007)

MCIW inherited the RCO-SW while it was in the process of regionalization of contracting activities for the western Marine bases. The regionalization has increased and accelerated the contracting workload.

F. HEADQUARTERS MARINE CORPS

Installations management is identified by the Marine Requirements Oversight Council (MROC) as a High Impact Core Value Stream of the Marine Corps Enterprise.

All contracting activities fall within installation management HICVS.

The MROC is chaired by the Assistant Commandant of the Marine Corps and composed of permanent and associate members. The Deputy Commandant for Installations and Logistics (DC, I&L) is the process owner for the Installations Management HICVS. The DC I&L is responsible for Marine Corps Installations East, Marine Corps Installations West, and the National Capital Region. Figure 15 illustrates the complexity of this organizational structure.

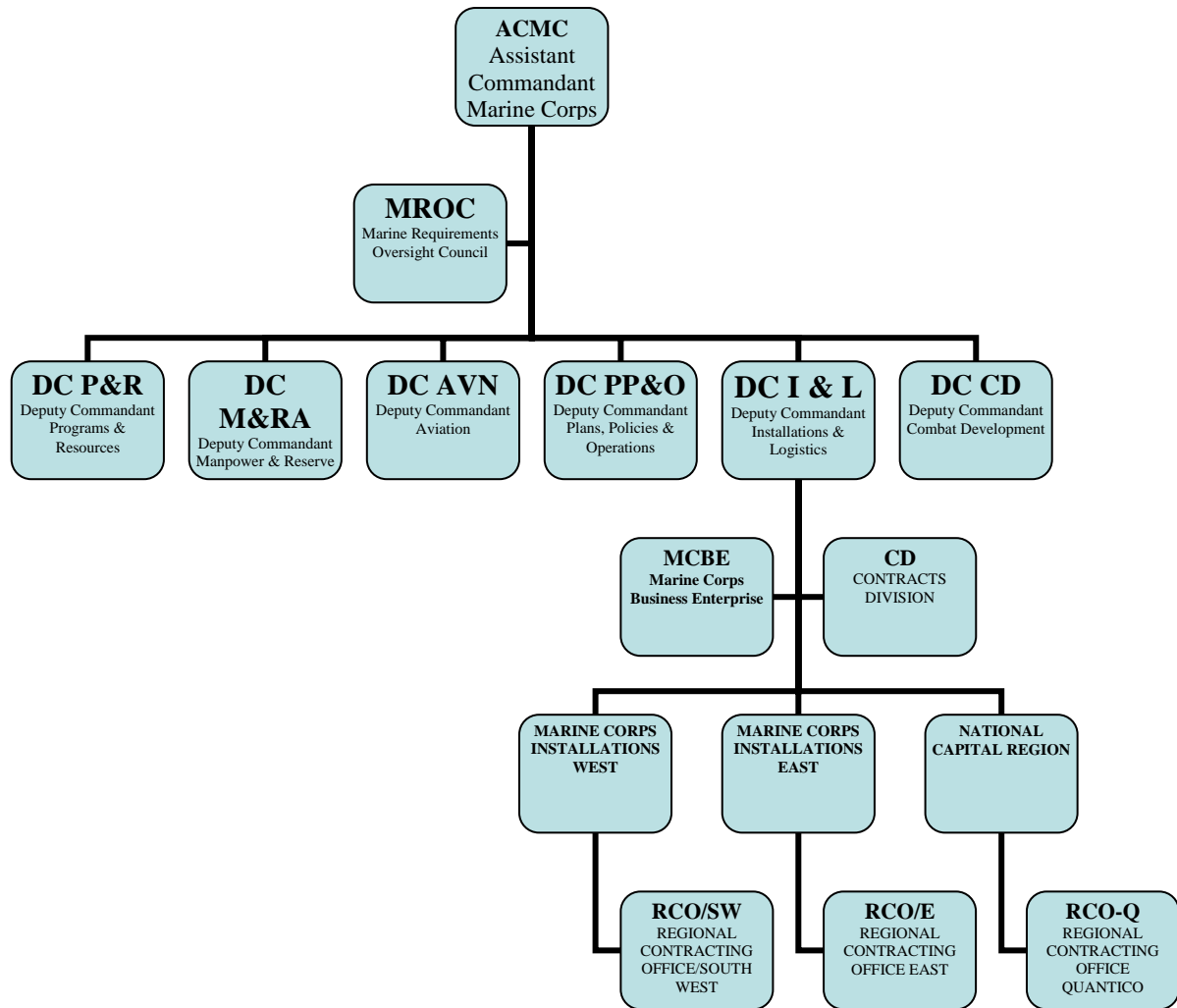


Figure 15. Command Structure for USMC Contracting

Contracting responsibilities within the USMC are divided between two Heads of Contracting Activity (HCAs): 1) DC, I&L and 2) the Marine Corps Systems Command (MCSC). DC, I&L HCA has delegated contracting authority to the RCO-SW via the Assistant Deputy Commandant (ADC), I&L (Contracts).

The DC, I&L (Contracts) is the next level above the RCO-SW that controls actual contracting processes at the RCO-SW. They are referred to as Logistics Branch (LB) by the employees of the RCO-SW. They ensure compliance with federal contracting

regulations and generate contracting and acquisition policy for the Marine Corps (CMPG Website, 2007). The following nine roles have been established for LB:

- Set contracting policy and oversight in acquiring supplies and services for the MCFCS, including Marine Corps Logistics Command (MCLC), Marine Corps Contingency Contracting Offices (CKOs), and Marine Corps bases and stations.
- Integrate USMC procurement/contracting policies and procedures in the Marine Corps Acquisition Procedures Supplement (MAPS).
- Act as the Competition Advocate for the USMC.
- Provide Procurement Performance Management Assessment Program (PPMAP) policy and guidance.
- Serve as the Community Manager for the USMC Contracting Career Field in collaboration with MCSC, to provide an enterprise perspective for managing the military and civilian contracting workforce.
- Implement and Direct the USMC Small and Disadvantaged Business Utilization (SADBU) Program, partnering with MCSC to maximize Small Business participation within the Marine Corps.
- Serve as the Program Manager for the USMC Government wide Commercial Purchase Card (GCPC) Program and serve as the Level III Agency Program Coordinator (APC).
- Serve as the functional Point of Contact (POC) for Paperless Acquisition (e.g., Standard Procurement System (SPS), Wide Area Workflow (WAWF), PR Builder, FPDS-NG) as well as automated systems such as Contractor Performance and Assessment Reporting System (CPARS).
- Coordinate all reporting requirements in collaboration with MCSC, as determined on a case-by-case basis, to determine whether reporting requirements will be consolidated or submitted separately. (CMPG Website Introduction II. A.)

Logistics Branch (LB) has the following stated mission:

Provide the right tools and guidance to our Marine Corps Field Contracting System (MCFCS) to fully support Marines. We will achieve our mission through the efforts of a highly skilled, multi-disciplined, and professional workforce.

(CMPG Website Introduction II. A.)

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IV. USMC CPI PROJECT AT RCO-SW: LEAN SIX SIGMA IN ACTION!

A. INTRODUCTION

The RCO-SW represents the perfect LSS model to study. Why? Because, from inception in February through termination this December, 2007, the project followed every step of the DMAIC⁴ method in LSS. Chapter IV analyzes each step of the way and paints the bigger CPI picture of one specific test site: RCO-SW.

Capitalizing on the necessity of continuity, the researchers chose to evaluate the LSS project at the RCO-SW. A member of the research group attended project meetings from beginning to completion. The project was designed to reduce procurement administrative lead time PALT. Figure 16 graphically depicts PALT. The project focused on this area to reduce the time of contracting actions and provide better service to the customer.

⁴ DMAIC: Define, Measure, Analyze, Improve, Control

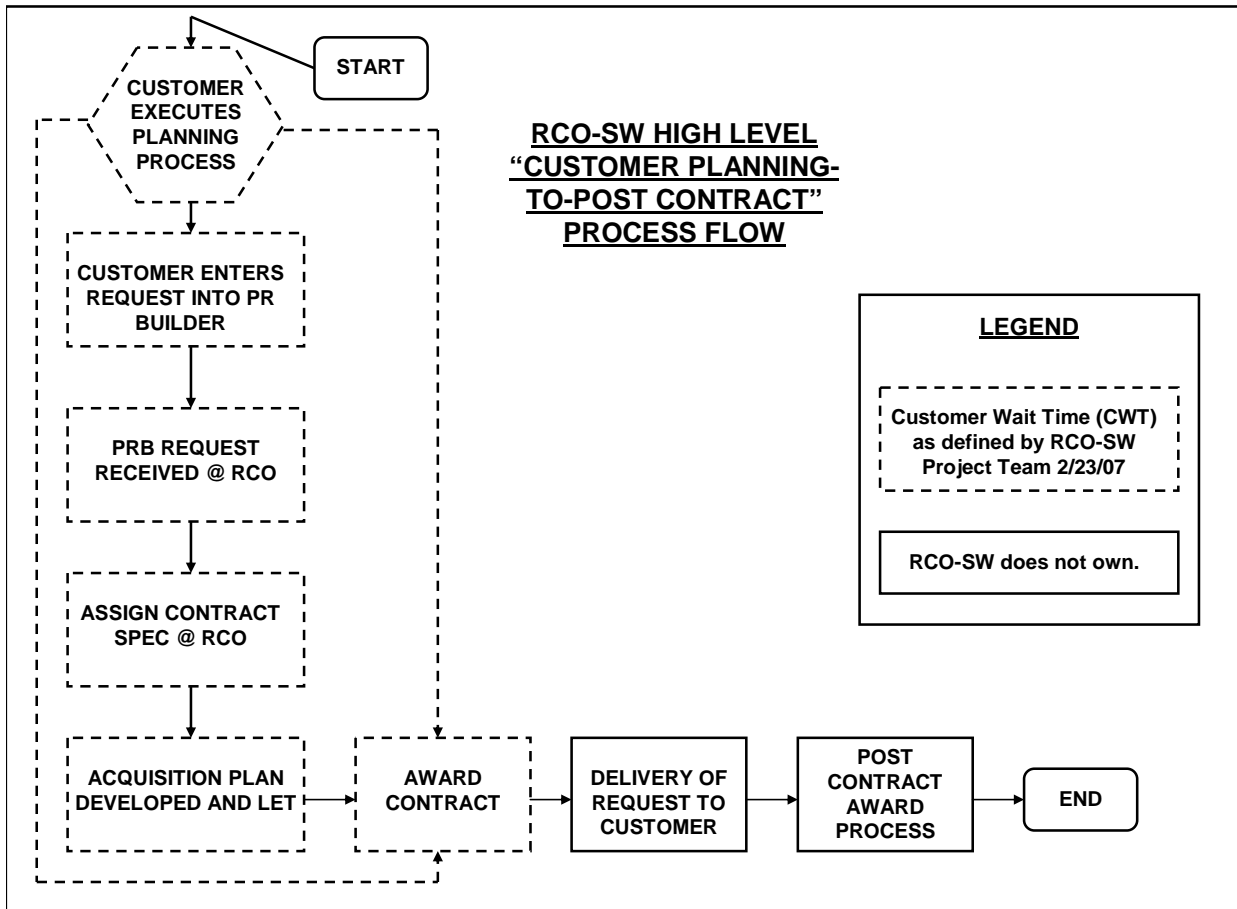


Figure 16. RCO-SW Process Flow (After Reath, 2007a)

The illustration of customer wait time is displayed in the large dashed box and is inclusive of the processes that affect PALT. For the purposes of this project the PALT components are:

- Customer execution of the planning process
- Customer enters request into PR Builder (PRB)
- PRB request received at RCO
- Assign contract specialist at RCO
- Acquisition plan developed and executed
- Award contract

Regionalization of the RCO-SW resulted in the assumption of more contracting responsibilities for the subunit bases of MCIW as well as MCIW becoming a High Performance Organization (HPO) in FY 06. In addition to the HPO selection, acquisition is identified by the MROC as a *High Impact Core Value Stream* of the Marine Corps Enterprise. Consequently, the RCO-SW became a selected unit for a Marine Corps CPI project.

The CPI project commenced 21 February 2007, with a briefing from the CPI team black belt, GS-14 Kimberly Reath. The discussions sequentially “walked” the team members through the selection of the RCO-SW, CPI processes, and team construction (Reath, 2007a).

- Why RCO-SW?
- CPI in the USMC and how it ties to OSD and DON programs
- Project Sponsor, Black Belt and Green Belt roles and responsibilities
- Lean, Six Sigma, and TOC introduction
- LSS Methodology DMAIC
- CPI Tools
- Project Charter: changes requested and made
- VOC: tools to gather VOC
- VOB: PALT and who defines this and what they really measure
- Lean and removing *muda*: seven types of waste
- SIPOC
- High level process view
- Team Communication: within the team and within RCO-SW
- Team Member Roles

The meeting spent considerable time on certain issues requiring thorough review. This represented the “**Define**” component of DMAIC. Specifically for this project, lengthy discussion concentrated on the Voice of the Customer (VOC). Team members initially emphasized that customer planning time is not a component of PALT. Customers demonstrated ignorance of the actual contracting processes that the RCO must

follow: Mandatory rules and regulations the FAR imposes in 100% of contract awards. The team believes that this results in a misguided perception of unnecessary wait time during PALT.

Last, the team discovered another problem inherent to the process, *the end-user customer is often not the individual that enters the request data into PR builder*. The detachment of the customer from the process causes the first point of information breakdown between the customer and the RCO.

The meeting continued with suggestions and a discussion of how misperceptions can be corrected. The VOC should originate from a customer whom understands the process and can give valuable input to the project. Education of the customer was identified as a way to add value to the VOC.

CPI is an ongoing process. Constant education is required to aid the customer in developing needs requests to reduce cycle time consumed as the request moves through the RCO. Personal liaisons and working relationships are critical to the contracting process primarily due to the variability of customers and requests.

The variability of customer requests' provoked discussion of standardization processes in need of refinement. The uneducated customer adds considerable non-value-added (NVA) time to the contracting process. This situation could be resolved by delineating prerequisite information needed from the customer before a request is submitted to the RCO. Agreement was reached that clarity in identifying form, fit, and function of the item or service requested is essential. Form defined as "what does it look like?" Fit defined as "how is it used?" Function defined as "how will it be used?" The distinct problem of a highly-variable, complex process is further deteriorated by poor customer data entry from inception

In 2006, the Bradson Corporation generated a report called *HQMC Service Acquisition Transformation* and specifically addressed the issue:

Problems in generating a proper statement of work add greatly to PALT and this increases the cost of doing business. This can be exacerbated when there is poor communication between the requirements drafter and the contracting office. The typical response to a poor statement of work is for the contracting office to simply return the document to the drafter for rework. Based on interviews and earlier discussions with the members of the Marine Corps acquisition community, this is a common practice. At a Business Enterprise Office/Contracts Department co-sponsored Marine Corps Service Acquisition Capability Conference in Columbus, Ohio, in October 2004, problems drafting the statement of work was identified as the most significant acquisition challenge. In fact, it has been estimated that virtually every statement of work is returned to the originator at least once for redrafting.

(Bradson, 2006, p.12)

The meeting continued with suggestions to educate and train the customer to improve the contracting process. Examples offered were similar to online instructional portals where a customer has access to templates assisting them in entering critical information relating to specific requests to the RCO. A basic online instructional manual would benefit the customer as the current Marine Corps Contract Management Process Guide (CMPG) was too complicated for the average customer.

The input from the team was given serious consideration by the CPI Black Belt. She redirected the group to give suggestions recommending better methods of collecting VOC. The most effective method included: One-on-one interviews, focus groups (6-10 people), and surveys. All attendees agreed to continue discussion of this issue in subsequent meetings. The meeting was then adjourned.

The meeting was a critical step in the implementation of this CPI project. Realizing a buy-in is required for project success, the customer was allowed to voice concerns, positions and apprehensions. Just as Marines have little understanding of CPI requiring an educational introduction, the black belt has little understanding of specific processes inherent to the units they will facilitate

B. DEFINE (“D” OF DMAIC)

The RCO-SW CPI project progressed with a charter encompassing four essential components of the project.

1. Business Impact

Successful completion of this project will reduce the average cycle time required to process a Purchase Request (PR) from receipt in PR Builder to development of the acquisition plan including the fully developed Statement of Work (SOW). Benefits of this reduction in cycle time include reduced cycle time for procurements for the warfighter, and workload balancing within RCO-SW by applying efficiencies gained in the beginning of the process towards post contract award workload.

2. Problem & Opportunity Statement

The warfighter may be delayed in meeting mission requirements due to time spent planning for and procuring products and services through RCO-SW. A lack of adequate post-contract resources may result in increased contract costs/modifications and decreased quality of deliverables through poor contractor performance.

3. Goal Statement

The goal of this project is to reduce the average Simplified Acquisition Procurement Branch (SAP) Procurement Action Lead Time (PALT) by 3 days (PRs <\$10K), by 12 days (PRs >\$10K). Average cycle time will be reduced by decreasing the time spent obtaining required information from the customer and the vendor. Process variation will be decreased through standardization of the RCO-SW SAP process.

4. Project Scope

This project is supported by a Project Sponsor. The scope of work focuses on the SAP from development of the request by the customer to receipt of the request and the award of the product.

Due to the complexity of the contracting process, the project charter was designed to only address the SAP branch. SAP only provides service to customers with contracts

that are less than 100,000 dollars. Contracts greater than that amount are considered large contracts and are processed by another subunit of the RCO. The constraint being set, it was then time for the project to readdress and focus on the VOC.

Region-wide surveys provide the best return from the customer. The surveys allow anonymity providing a forum to be candid. Significant customer dissatisfaction with PR Builder was discovered while reviewing the survey comments. Most customers expressed frustration with the software. Many remarked the problem was worsened by an inability to have hands on assistance with their procurements (especially PR Builder assistance.) The consolidated results (Reath, 2007b) of the survey:

- Of the units surveyed (I MEF, Base, 1st Mar Div, 3rd MAF, MCAS, Tenant, Other) 74% responded.
- 65% stated that the product or service they receive meets their requirements.
- 35% stated it was “easy” to submit a purchase request to RCOSW.
- 23% stated they had a complete understanding of the role of RCOSW in the procurement process.
- 68% stated using PR Builder was the most challenging step in the procurement process.
- 32% stated they engage RCO-SW in their process at initial planning.

C. MEASURE (“M” OF DMAIC)

The respondent information forced the project black belt to focus the CPI efforts on the shortfalls with PR Builder. Information was gathered to assess the time consumption, or waste in the system. Time for SAP procurements were excessive. Different variables were offered to explain the shortfall. Customer unfamiliarity with the program was the major impediment observed by the team. The customers surveyed suggested this single process hurdle could be eased by the RCO-SW implementing more hands on service and availability before further problems could arise. Reducing friction at this step also serves to reduce the cycle time using PR Builder.

Table 2 (below) gives a numerical representation of the statistical analysis conducted by the project black belt with data collected and provided by the team. It

provides data on PR Builder and metrics on the total procurement process. With this data, the black belt then focused the CPI efforts on decision points.

Table 2. Quality and Cycle Time @ PRBuilder (From Reath, 2007b)

Dollar range	Average Value	Average Days in System	Average # of Returns
\$0 – 9,999	\$5,518	15.42	1.0
\$10,000 – 25,000	\$16,911	6.82	.65
\$25,001 – 50,000	\$31,824	6.50	.50
\$50,001 – 100,000	\$65,831	11.83	1.83
\$100,001 – 300,000	\$172,602	7.33	.67
\$300,001 - \$520,000	\$379,396	21.60	1.80

Using the data from Table 2, identified constraints of the system defined further dollar-amount segments of the FY06 work breakdown visible in Table 3 below.

Table 3. Work Breakdown by \$ Segments (From Reath, 2007b)

	Total number of Requests	Percent of Total Requests
<\$10K	1108	57.62%
>\$10K <\$25K	357	18.56%
>\$25K <\$100K	240	12.48%
>\$100K	56	2.91%

Notice the majority of work requests fall under the \$10,000 range. Consequently, this bottleneck became the focus of effort.

Summary of “Measure:”

- Focus on requests <\$10K as they present 57.62% of total requests received each year. More specifically requests amounting to less than \$10K would be analyzed for the project.
- Create a team of SAP Buyers to recommend improvements to this process.
- Reduce cycle time for end user to accurately enter data for their request into PR Builder.

D. ANALYZE (“A” OF DMAIC)

The next step for the project is the “Analyze” component of the DMAIC process. This is accomplished by completing a Failure Modes & Effects Analysis (FMEA). FMEA was utilized for each step of the SAP purchase less than 10,000 dollars identifying failures and their effects. It then identifies causes and assigns values to identify which steps most adversely affect the purchase process. The equation to identify the most detrimental portions of the process is:

Severity (x) Occurrence (x) Detection (=) Risk Priority Number (RPN.)

Viewing the table below, notice the *Create PR* process has the highest RPN, creating the most prevalent issue to be addressed in the IMPROVE phase of DMAIC. Table 4 represents the FMEA analysis data for this project:

Table 4. Failure Modes & Effects Analysis (FMEA)<\$10K (From Reath, 2007b)

Process Step	Potential Failure Mode	Potential Failure Effects	Severity	Potential Causes	Occurrence	Current Controls	Detection	RPN
Create PR	Unclear PR	Delay in procuring	10	System	10	OJT	10	1000
Vendor return call of inquiry from Buyer	Unsure of actual price	Delay in procuring & time	8	No deadline/ input metric	5	Can use GS schedule with no return call	10	400
Sole Source documentation	Incomplete justification submitted	Delay in procuring from Vendor	7	Unclear on rules surrounding sole course procurement	5	CBT training at CMPG web site	10	350
Customer return call of inquiry from Buyer	Incorrect item procured.	Negative quality and delay in procurement	6	Busy doing other mission oriented tasks	5	None	10	300
Mission to Train Marines while meeting quality and time standards	Defect in procurement of item requested	Negative quality and delay in procurement	6		5	None	7	210

Further analysis is accomplished by a Cause and Effect Diagram (CED). The CED allows for focused identification of the causes that result in unnecessary wait time. It specifically addresses the areas of Systems, Procedures, Policies, and Workforce. Focused analysis of these areas reveals fundamental faults in the process that can be improved or removed all together. Figure 17 illustrates those areas.

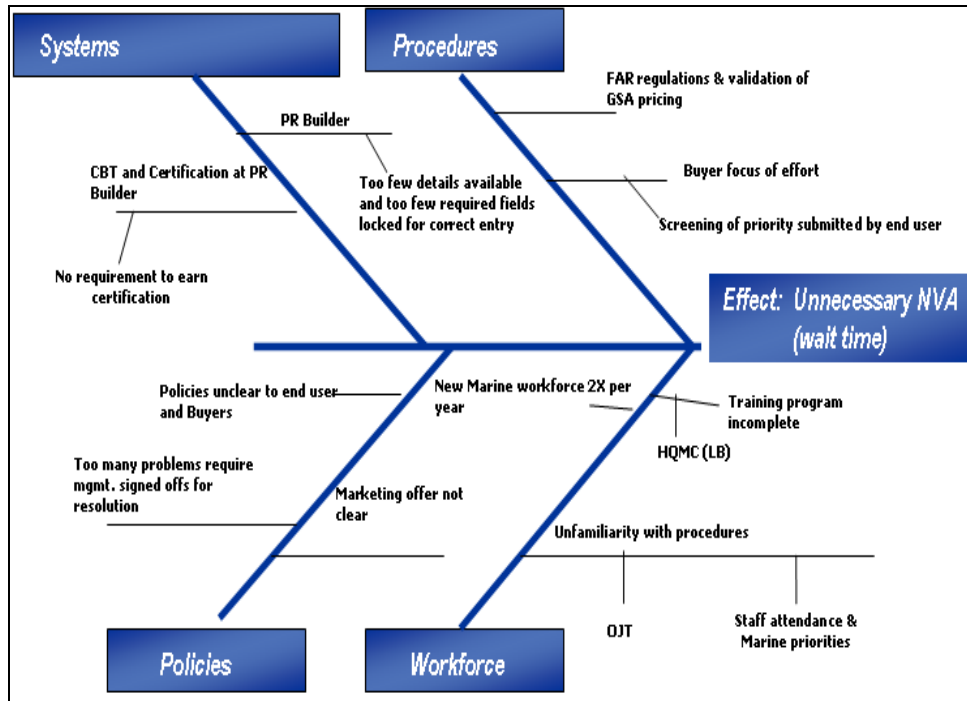


Figure 17. Cause and Effect Diagram (From Reath, 2007b)

E. IMPROVE ("I" OF DMAIC)

The next step in the CPI DMAIC process is Improve. The method of "poka-yoke" was implemented. Poka-yoke means mistake proofing. A successful poka-yoke tool prevents incorrect information or requirements to be passed to the next step in the process. The results ensure an operation literally cannot be performed incorrectly.

The RCO-SW team identified multiple requirements incorporated into the IMPROVE component of DMAIC. Pertinent requirements will be submitted to the Headquarters Marine Corps in the form of recommendations for approval and implementation. The following list (Reath, 2007b) highlights the requirements developed by the team:

1. Modify the PR Builder

- This will result in increased quality of information provided to the buyer.
- Reduce procurement cycle time by decreasing the time spent processing the request from the buyer.

2. Develop Customer Relations.

- Give customers a maximum three day final response to inquiry for final inspection. Failure to respond will result in a “return to sender” This forces the customer to insure quality and gives them a voice.
- Provide training via email and on-site sessions that will educate the customer to this new requirement.

3. Cultivate Vendor Responsibilities.

- Government Services Administration (GSA) schedule vendors to be given a maximum two days to respond to inquiry for best price. Lack of response will cause the buyer to use the schedule price listed.
- Provide training (via email) which will educate the vendors to this new requirement.

4. Adjust Staffing Requirements.

- Hire an additional three GS-07 buyers.
- Increase quality of information provided to the buyer at first pass and reduce procurement cycle time by decreasing the time spent processing the request

5. Reductions.

- Value added reduced from 8.27 hours to 3.48 hours.
- Establish metrics for response time from end user to vendor.
- Use the GSA schedule: GSA buys account for approximately 80% of requests less than \$10K. This will reduce time calling vendors.
- Assign a team leader to the buyer on the same day of the approved request.
- Provide one-hour review of “ready to buy” criteria and contact end user for clarification.
- Review GSA schedule and award.

Table 5 numerically demonstrates the improvements that can be achieved with the recommended changes while outlining requirements for improvement of the SAP purchase process. The desired result is to reduce the current average 15.5 days to less than 5 days with minimal work flow design and zero defects.

Table 5. Key Improvements <\$10K (From Reath, 2007b)

Process Step	From	To	% Improvement
End User data entry @ PR Builder	15.42 days	<5 days	68%
Buyer clarification with End User		2 days	
Buyer procurement process (PR)	8.85 days	<5 days	44%

Figure 18 (following page) graphically demonstrates the reduction in mean time from 15 to five days. This means (on average) the customer spends over 10 days LESS time entering data into the PR builder assuming all project recommendations are implemented.

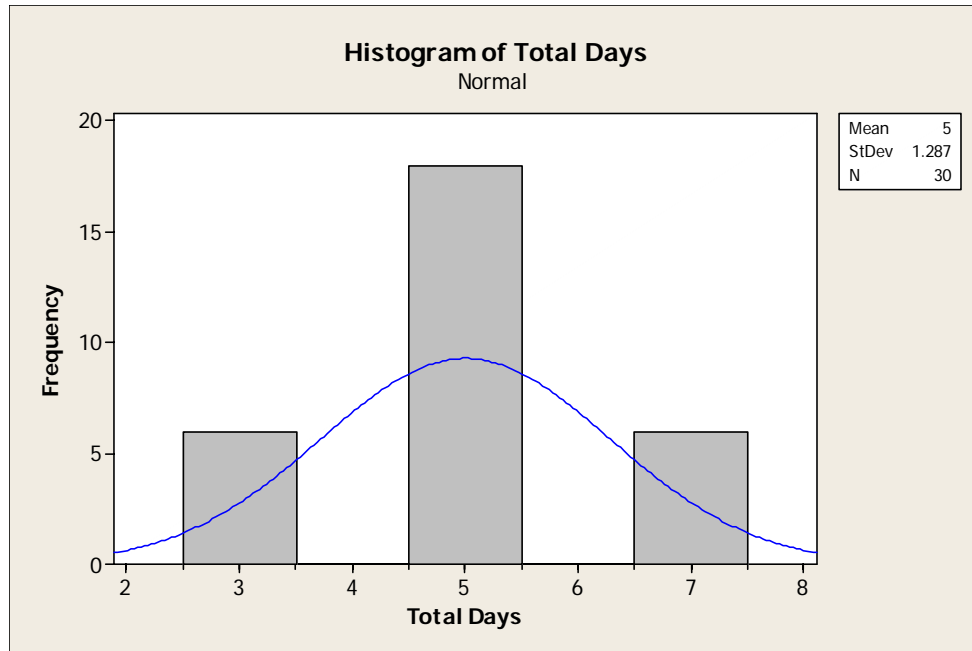


Figure 18. Buyer Improvement @ Total Days <\$10K (From Reath, 2007b)

F. CONTROL (“C” OF DMAIC)

The final part of the CPI DMAIC process is “Control.” To prevent the process from reverting to its original form, the control summary outlines the following:

- What to measure
- Why measure it
- How is it measured
- Specifications and target values
- How reported
- How enforced
- Who owns it

This part of the project ensures the benefits of CPI are not lost. It demonstrates what actions need to be taken and whose responsibility it is to ensure sustained success. Tables 6 and 7 display the controls necessary for implementation into this project.

Table 6. Summary of Control 1 (From Reath, 2007b)

Control Plan							
What to measure	Why measure it	How measured	Specifications and target values	How reported	How Enforced	Owner	Big Y
Cycle time	To ensure standardized process	Add entry point for date awarded.	Avg. time from Buyer receipt of PR to award. (PALT) = 5 days	Buyer must close out PR in PD2 (PALT)	Random check by Team Lead to ensure Buyers are entering data.	Team Lead and Supv.	PR
Implementation of recommendations for PR Builder	Key to reduction in cycle time	Track at HQMC LB, P&R, SYSCOM	Implement ASAP	Weekly update with HQ POCs		Director RCOSW	PR
Training of Buyers	Key to quality procurement within FAR regs.	Monthly monitor of training plans.	100% DAWIA Lev 1 by 1 October 07	Monthly update to Dir, RCOSW	Monthly review of training plan.	Branch Supv.	PR
Communicate metrics to Vendors and End Users.	Educate on supplier expectations and reduce cycle time	Monitor Vendor and End User performance against the goals,	Vendors and End User respond to inquiries from Buyers w/ 1 2 days.	Buyers weekly results.	Buyers will take no response as a bid and will send PR back.	Buyers	PR
Add entry in PD2 to track date Buyer makes the award	This will determine the actual touch time of the Buyer vice the close out at receipt of item.	PD2 and report formatted.	Avg. cycle time to procure PRs <\$25K is 5 days.	Admin Chief pulls report monthly	Dep. Director reviews the data for performance level.	Dep. Director	Perf. Data

Table 7. Summary of Control 2 (From Reath, 2007b)

Control Plan							
What to measure	Why measure it	How measured	Specifications and target values	How reported	How Enforced	Owner	Big Y
Hire (3) additional GS07 Buyers to support yearly workload in SAP and use Marines in training to compliment output.	To ensure standardized process	Add entry point for date awarded.	Avg. time from Buyer receipt of PR to award. (PALT) = 5 days	Buyer must close out PR in PD2 (PALT)	Random check by Team Lead to ensure Buyers are entering data.	Team Lead and Supv.	PR
Reorganize the SAP branch with two sections: <\$25K and >\$25K ea with Civ Ld	80% of requests are <\$10K and can be purchased on GSA. >\$25K has additional FAR requirements. Train Marines and new Civ to this level of acquisition.	Final implementation of reorganization design.	Implement ASAP	Review of reorg presented to Director	Monitor performance.	Director RCOSW	Org Mgt.
Move QA Marine onto SAP <\$10K work team	Increase FTE supporting 80% of the RCO mission.	Implementation of move.	One additional FTE assign to SAP	SAP Branch Supv.	Implement ASAP	SAP Branch Supv.	Org Mgt.
Development of Process SOP	Will be a key training document for Marines and Civilian Buyers.	Process Complete	Complete Process SOP by 30 November 07	From Team Lead to Branch Supv.	Branch Supv. Checks on progress.	Team Lead	PR

G. ANALYSIS

1. Introduction

An examination of the project provides an understanding of the specific problems being addressed as well as knowledge of Lean Six Sigma methods and insight into the USMC CPI Program. The framework for our assessment is shown below in Table 8.

Table 8. Outline of Assessment Areas

Project Alignment Are the objectives of the project aligned with CPI guidance and the organization's mission?
Project Scope Do the problem and process definitions address customer needs and satisfaction?
Project Goals Do the project goals add value to the customer and the organization?
Method and Metrics Is the DMAIC method effective for process improvement? Do the metrics provide the right information?
Project Results Was the CPI project effective in providing meaningful results? Will the results meet the goals that the project set out to accomplish? What improvements can be made regarding CPI project execution?
CPI Program What insights about the CPI Program can be derived from the observation of the project?

2. Project Alignment

The preceding chapters demonstrate how the top-level guidance of the CPI Program translates to the tactical level during process improvement implementation. The Marine Corps High Impact Core Value Streams are evaluated for improvement and the MROC determines which improvement projects are undertaken. RCO-SW is in the Installation Management HICVS, sponsored by the Installations and Logistics Department. CPI Program guidance is translated from the MROC and HICVS to the specific CPI team through the establishment of the project charter. The project charter is aligned with the organization's mission and it defines the team's mission, scope and objectives. The charter is endorsed by the sponsor and is the critical factor giving the team the direction and support needed for success (Wortman et al., 2007). In accordance with Lean Six Sigma and CPI methodology, the project team begins its endeavor by listening to the VOC because value is defined by the customer. Table 9 demonstrates the CPI Team's objectives are focused on the customer and aligned with the mission of the organization and CPI Program guidance.

Table 9. Program, Organization and Project Alignment

<p style="text-align: center;">CPI Program Mission</p> <p>Provide enhanced support to Marine Corps Operating Forces by using continuous process improvement to reduce cycle times, optimize process reliability, and provide affordability.</p>	
<p style="text-align: center;">RCO-SW Mission</p> <p>Provide supplies and services to Marine Corps Base Camp Pendleton, tenant commands and activities; and all bases, camps, post and recruiting districts within the MCI West region.</p>	
<p style="text-align: center;">Project Charter</p> <p>Business Case: (1) Reduce procurement cycle time for the warfighter (2) Improve workload balance within RCO-SW.</p> <p>Problem Statement: Warfighter mission requirements may be delayed due to procuring products and services through RCO-SW.</p> <p>Goal Statement: (1) Reduce average SAP PALT (PR<\$10K) by 3 days (2) Reduce average SAP PALT (PR>\$10K) by 12 days.</p> <p>Scope: Focus on SAP Branch from development of customer request to award.</p>	
<p style="text-align: center;">Voice of the Customer</p> <p>(1) 65% stated products and service met their requirements. (2) 35% stated it was easy to submit purchase request to RCO-SW. (3) 23% stated they had complete understanding of the role of RCO-SW. (4) 68% stated using PR Builder was the most challenging step in the process. (5) 32% stated they engage RCO-SW at the initial planning stage.</p>	

3. Project Scope

The scope refers to the boundaries of the project. It outlines the range of activities and areas to focus on. In order to set the boundaries, the problem and process to be improved must be properly defined. In this case, the problem is that the warfighter's mission may be delayed due to the time required to procure goods and services. Since this is a service environment and the RCO is facilitating the ability of the warfighter to obtain the goods and services required, reducing PALT is the correct approach. What is important is defining the start point and end point of the process to be analyzed and improved.

The key element is that the customer and the RCO have different perspectives pertaining to the beginning of the procurement process. For personnel employed in the RCO, tasks commence once a requirement in the form of a valid purchase request enters the system. The specifics of the job dictate personnel cannot execute a purchase request until the procurement details are known. On the other hand, the customer does not perform contracting and, for the most part, is ignorant to the process. The customer realizes a need and starts planning. From the customer's perspective, the starting point of the procurement process occurs far sooner than the actual contracting process does for the administrative personnel working in the RCO. Which perspective is correct?

In accordance with the concepts of Lean Six Sigma and CPI, the customer defines value, in essence forcing the CPI project team to adhere to the VOC. The process includes the time it takes for the customer to enter their requests into PR Builder, regardless of whether or not that request is approved or rejected later by the RCO. Even though the RCO personnel do not have a valid purchase request to work on, the customer definitely feels the time and frustration that it takes to get their requests correctly entered and approved and assigned to a specialist. This is an area of dissatisfaction discovered in the customer surveys and was appropriately addressed by the team. It would not have been a surprise for RCO personnel to only focus on the internal process within their control. By incorporating the *interface with the customer* while developing a purchase

request in PR Builder, the team demonstrated the CPI and Lean Six Sigma concepts of supporting the warfighter, focusing on the customer, and increasing the satisfaction of the customer.

4. Project Goals

The project goals were defined as reducing average SAP PALT by three days for purchase requests less than \$10,000 and twelve days for purchase requests greater than \$10,000. Based on the definition of the problem and the process, these are valid goals that improve the process and support to the warfighter. Since the interface between the customer and PR Builder was addressed and that time was included as an element of PALT, it may reduce a source of major aggravation to the customer if the average decrease in PALT is due, in part, to a decrease in the time that elapses between initial entry into PR Builder to the time of final approval of the request. Once recommendations for improvements have been implemented, procurement delays that impact the warfighter's mission may be reduced.

5. Method and Metrics

The DMAIC process has proven effective for several decades with numerous success stories in private industry and DoD. There are other improvement methodologies that can be used as well, such as the classic team problem solving approach or Deming's Plan-Do-Check-Act (PDCA) and Plan-Do-Study-Act (PDSA) approaches (Wortman et al., 2006). The classic team problem solving steps are similar to DMAIC: identify problems, define problem, investigate problem, analyze problem, solve problem, and confirm the results. The DMAIC problem solving method is superior to the other methods for two reasons. The first reason is that in accordance with CPI concepts, the focus is on the customer and their critical to quality issues. This was demonstrated when the process was defined to include the time it took for the customer to interface with PR Builder prior to the request being assigned to a specialist. The other methods may have overlooked this area and focused strictly on the process within the RCO. Second, the DMAIC method includes recommendations for controls as well as for improvements.

The improvements must be controlled and monitored to prevent going back to the old way of doing things. Implementing controls also helps to institutionalize the improvements and ingrain continuous process improvement into the organization's culture.

Metrics are the method and unit of measure that are used to describe a set of performance goals and standards (Wortman et al., 2007). Metrics are established in typical areas such as profit, cycle time, marketplace response and resources (Wortman et al., 2007). The purpose of metrics is to provide worthwhile information that helps the decision making process. For warfighters, their concern is to receive goods and services that meet their needs in a timely manner. Getting what they need is a reflection of their needs being correctly communicated through their requests to the supplier. The time it takes is a reflection of the procurement process.

In this project, there are two metrics that provide information to capture areas of customer concern. First, average PALT is one metric to analyze the procurement process within the RCO. Average number of PR returns is the second metric that applies to customer frustration. Since customers feel variation more than they feel averages, the authors were interested to see how the metric of average PALT addressed the fact that virtually every purchase request is initially rejected. The CPI team did take these occurrences into account by measuring the average number of returns. The team made recommendations to improve the step where the customer interfaces with PR Builder to decrease the number of returns. If this area is improved, average PALT for the overall process may improve and customer aggravation may decrease. This is a reflection of the proficiency of the team. The team correctly defined the problem and the process to include the PR Builder interface step because they understood the VOC. The team then identified the proper metric to analyze and improve that step to eliminate a major source of dissatisfaction with the customer.

The authors believe that the customer will not notice the effects of a decrease in overall average PALT unless they also feel the effects of not having their initial requests

rejected virtually every time. If improvement in this step of the process is not realized, the effects and the benefits of the CPI Program will not be significantly felt by the customer.

6. Project Results

a. How Effective Was the CPI Process?

The Marine Corps identified an area to be improved and chartered a team to execute the CPI project. The CPI team conducted training in Lean Six Sigma methods, defined the problem, process, and appropriate metrics to address the needs of the warfighter. Through the team's analysis, recommendations were provided that can feasibly decrease average PALT and average number of PR returns. Based off the principles outlined in Chapters II and IV, the CPI project at the RCO-SW was indeed effective. The CPI program identified constraints in the system and ultimately provided a better way to do business in the contracting arena. Lasting effectiveness depends on implementation, control and future iterations of CPI applied to the RCO.

b. Did It Meet the Original Goals?

As a process "still in motion," it is premature to determine if the team goals originally prescribed will in fact be accomplished. On a literal level, the project team provided recommendations that will meet all assigned goals and more importantly, allow the Marine Corps to witness the trial and error failures and victories of applying the CPI approach from "cradle to grave."

On a much larger scale, the program is the first step in the right direction. The Marine Corps needed to conduct this project and force individuals to participate in a new and challenging environment to improve the efficiency of daily operations while focusing on the way that they support the warfighter.

c. What Improvements Can Be Made to CPI Project Execution?

VOC should extend beyond surveys and questionnaires. The process would be more effective if the customer had significantly more representation on the CPI team. Active participation of the customer on the project would provide tremendous benefits to customer relations. The active participation of the customer on the project would result in a more constructive working relationship and foster cooperation between the organizations involved. This would prove beneficial because the development of customer relations was, in this case, identified as an area recommended for improvement.

7. CPI Program

CPI project deployment is the only aspect of the USMC CPI Program that is visible to the average Marine. Since CPI projects focus on the warfighter and are aligned with the CPI Program and organizational mission, CPI projects are an accurate reflection of the overall CPI Program. Successful execution of projects and implementation of improvements will foster a positive perception by Marines toward the CPI Program. Likewise, unsuccessful project execution and improvements that are not implemented will foster a negative perception by Marines toward the CPI Program.

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V. CONCLUSIONS AND RECOMMENDATIONS

A. INTRODUCTION

We have explored the boundaries of the Marine Corps' Continuous Process Improvement program. Beginning with Chapter I: The background, objectives, benefits of study, methodology and organization of the project were listed to provide direction and gain insight into the focus of effort.

Chapter II built the foundation necessary to understand the principles of CPI and the methodologies of Lean, Six Sigma and Theory of Constraints. *The USMC Business Enterprise Strategic Plan* (CMC, 2004) provided the strategic vision, supporting concepts and way ahead for the Marine Corps in conjunction with the Department of the Navy's overarching guidance and plan of attack. *The DoD Continuous Process Improvement Transformation Guidebook* (Deputy Secretary of Defense, 2006) was released as a resource for use in designing and managing CPI efforts enterprise-wide. Its goal is to expand and connect the previously isolated CPI successes as it establishes an overriding CPI culture that converges on best practices and shares information among its organizations. *The USMC Continuous Process Improvement Guidebook* (MCBEO, 2006) was designed and engineered as a resource for managing CPI efforts and translating DoD and DoN CPI guidance into program plans that are compatible with the distinct Marine Corps culture and environment.

Chapter III reverts to a micro-view of the Regional Contracting Office-Southwest to explain and organize the operating environment, its functions and how they relate to one another. This groundwork is essential for a thorough comprehension of the process flow, sub-units and command structures in relation to CPI.

Chapter IV represents the field work, analysis and details of the RCO-SW project from inception to completion. It covers in detail the DMAIC process (Define, Measure, Analyze, Improve, Control). The chapter fuses previous program theory and knowledge with the raw data compiled throughout the year and presents the data in a logical and

educational manner. The tables, charts and diagrams combine to form a compelling argument in support of the benefits derived from the principles of Lean, Six Sigma and Theory of Constraints.

Chapter V summarizes our methodology, answers the difficult questions and provides recommendations to the original goals of the project as well as other issues that surfaced during the course of our research.

B. PRIMARY RESEARCH QUESTION

Can CPI identify feasible improvements to be made in the Marine Corps contracting process to reduce procurement administrative lead time?

1. Conclusion

CPI is an effective tool if the recommendations provided by the CPI project team are actually implemented. This project identified specific areas of improvement that will result in a significant decrease in PALT and more importantly, increase the satisfaction of the warfighter. CPI can create positive by-products in association with chartered projects. The project forged a catalyst to communication with the customer that would not have otherwise existed. CPI generates spin-off ideas for projects to further improve organizational processes effective in identification of other contracting inefficiencies through perpetual CPI evaluations.

2. Recommendation

Implement the recommendations for improvement made by the CPI project team. These recommendations include:

- Modify the PR Builder
- Develop Customer Relations
- Cultivate Vendor Responsibilities
- Adjust Staffing Requirements
- Reduce Non-Value-Added Activities. (Reath, 2007b)

C. FIRST SUBSIDIARY QUESTION

What principles of Lean, Six Sigma and Theory of Constraints apply to the USMC CPI project at the contracting office?

1. Conclusion

Principles from Lean, Six Sigma and TOC applied to the project at the RCO. A key concept of Lean and Six Sigma is to focus on the customer. The project team gathered survey data from the RCO's customers at the start of the project. Customer input highlighted the importance for the team to focus on the interaction between the customer and PR Builder.

Lean techniques were employed to increase speed and to identify and eliminate wastes. During the project, the classic wastes of wait time and extra processing were identified and addressed. Reducing the extra processing time required for handling rejected purchase requests will reduce cycle time. Receiving the correct information at the beginning of the process reduces the time spent by contracting personnel to complete their work.

The team at the RCO used the Six Sigma DMAIC problem solving approach to conduct the project. The team employed Six Sigma tools such as the project charter, cause and effect diagram, and process flow map.

The concept of TOC is to continually achieve more of the goal of a system. The goal of the RCO is to process requests and award contracts. The first step in TOC is to identify the system's constraint and then exploit it. An indication of a constraint is the accumulation of rework preceding a process step. Virtually every request is rejected for corrections. This type of constraint is referred to as a time trap because of the wasted time spent on rework. From the TOC perspective, the first thing to be addressed and corrected should be the time trap due to rework required on purchase requests.

2. Recommendation

Apply the technique of poka-yoke (error-proofing) to reduce errors while filling out requests in PR Builder, as recommended by the CPI project team.

D. SECOND SUBSIDIARY QUESTION

How can CPI be effectively implemented within Marine Corps culture?

1. Conclusion

For improvements to be effective, their implementation must include management support, training, rewards and reinforcement (Wortman et al., 2006).

2. Recommendation

Incorporate rewards and reinforcement into the CPI Program. Incentive must be considered if the Marine Corps is to successfully implement CPI. Proactive Marines that are willing to assume leadership and advocate roles for CPI should be compensated accordingly. A method to motivate Marines should be used that is appropriate to military culture. Marines are evaluated on how they perform their assigned tasks. Positive CPI results should equate to recognition in positive fitness reports from senior leadership. Additional recognition can take the form of awards and other command driven compensation.

CPI should be a component of inspections for units. The Marine Corps uses the Commanding General Inspection (CGI) as an evaluation tool for senior leadership to assess the readiness and proficiency of units. CPI as an evaluation subset will demonstrate the seriousness of senior leadership dedication to the process. It will also serve to formally integrate CPI into Marine Corps culture.

E. THIRD SUBSIDIARY QUESTION

Once improvements are implemented, will RCO-SW witness a substantial reduction in lead time?

1. Conclusion

If the project team's recommendations for improvement are successfully implemented, customer data entry into PR Builder will take less than five days instead of

the current average of 15.42 days. The procurement process within the RCO will also be reduced by four days on average. This means that the customer may expect contract award within approximately 12 days instead of 24 days. Is this substantial? Statistically it is a 50% improvement. Customers will probably feel this is a substantial improvement. More important than a reduction in average time for the process, the customer will be delighted if they don't have to perform rework on their original purchase requests.

F. FOURTH SUBSIDIARY QUESTION

What recommendations can be made to make future implementation of CPI projects more successful?

1. Conclusion

As customer satisfaction increases, interest in continuous process improvement will increase. As work balancing and productivity improves within an organization, the acceptance of continuous process improvement will increase. CPI will become self-perpetuating within the Marine Corps when those involved witness visible progress and experience the benefits of improved speed, quality and reduction of waste.

2. Recommendation

Apply control measures to improvements once they have been implemented. For success of the CPI Program and future CPI projects, the recommendations for improvement in the pilot projects must be successfully implemented. Once implemented, control measures must be put in place to reinforce the changes.

3. Recommendation

Incorporate rewards and reinforcement into the CPI Program. The CPI Program provides guidance on roles and responsibilities for leaders involved with CPI. It also provides the framework for training and development of CPI practitioners. Rewards and reinforcement are necessary for the implementation of any program or project. Additions should be made to the CPI Program to include guidance on rewards and

reinforcement. Rewards can be categorized by the value to the receiver. Wortman et al (2007) provides some examples. For instance, rewards of significant value include cash, vacation time and awards. Rewards of incidental value include small amounts of cash, trophies, plaques, certificates, special parking spaces, pictures posted on bulletin boards, and free meals. Intangible rewards include satisfaction, learning experience, thanks, admiration, and prestige.

The incorporation of rewards into the program demonstrate the level of commitment and support for the long term success of the program and for the successful implementation of CPI projects. Project leaders and members should be rewarded for their efforts and successes. A reward and reinforcement system incorporated into the program will provide incentive to the workforce and demonstrate commitment from superiors. If success is appropriately rewarded, it should be expected. If success is not appropriately rewarded, it is only hoped for and the status quo should be expected.

G. FINAL CONCLUSIONS AND RECOMMENDATIONS

1. Final Conclusion

The MBA project described the background of USMC CPI and Lean Six Sigma. The CPI Program is aligned with organizational missions, CPI project objectives, and VOC. The CPI project at RCO-SW provided a real world example of Lean Six Sigma in Action. The techniques of Lean Six Sigma and TOC provide numerous tools that are applicable to various problems and processes. These techniques have been successfully applied for several decades in the civilian sector, so it is not a question of whether CPI can benefit the Marine Corps. The issue is the effective change management required to successfully apply the CPI Program to reap the benefits. Effective change management requires leadership commitment, a robust training plan, and a system of rewards and reinforcement.

2. Recommendation

Encourage CPI training and make CPI practitioner billets attractive. Once the USMC CPI Program is mature, success can be measured by the number of beneficial projects, cost savings, decreased lead times, increased quality, and the satisfaction level of the warfighter. The program will become culture when there are visible improvement benefits and a cadre of in-house Marine CPI practitioners residing within each HICVS. One measure to ascertain the strength of the CPI culture will be the degree to which Marines seek CPI practitioner training and billets.

3. Recommendation

Empower the MCBEO to a status equivalent to all deputy commandant offices and share an equitable position on the MROC. The Marine Corps Business Enterprise Office requires greater visibility and prominence. It is difficult to expect an office, currently embedded within the structure of Installations and Logistics (I&L) to possess the ability to implement and control an enterprise-wide approach for CPI efforts. MCBEO must be a component to the special staff for the ACMC. This move would allow the MCBEO to effectively utilize its business influence across the Marine Corps.

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